GE Healthcare

# Technical Publication

## Direction 5197293-100
## Revision 1

## GE Healthcare
## Vivid™ e Service Manual

**Operating Documentation**

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# Important Precautions

- **THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.**
- **IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.**

**WARNING**

- **DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.**
- **FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.**

- **CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.**
- **SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.**

**AVERTISSEMENT**

- **NE PAS TENTER D'INTERVENTION SUR LES éQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS éTé CONSULTé ET COMPRIS.**
- **LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAîNER CHEZ LE TECHNICIEN, L'OPéRATEUR OU LE PATIENT DES BLESSURES DUES à DES DANGERS éLECTRIQUES, MéCANIQUES OU AUTRES.**

- **DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.**
- **FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENö TIGT, IST ES AUFGABE DES KUNDEN FüR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.**

**WARNUNG**

- **VERSUCHEN SIE NICHT, DAS GERäT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.**
- **WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLäGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.**

**AVISO**

- **ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.**
- **SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.**
- **NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.**
- **LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.**

**ATENÇÃO**

- **ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.**
- **SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.**
- **NÃO TENTE REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.**
- **O NÃO CUMPRIMENTO DESTE AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A' CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.**

**AVVERTENZA**

- **IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.**
- **SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.**
- **SI PROCEDA ALLA MANUTENZIONE DELL'APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.**
- **NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL'ADDETTO ALLA MANUTENZIONE, ALL'UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.**

このサービスマニュアルには英語版しかありません。
GEMS以外でサービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。

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All electrical Installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations and testing shall be performed by qualified GE Healthcare personnel. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE’s electrical work on these products will comply with the requirements of the applicable electrical codes.

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|---|---|---|---|---|---|
| Title Page | 1 | Chapter 2 - Pre-Installation pages 2-1 to 2-10 | 1 | Chapter 7 - Diagnostics/ Troubleshooting pages 7-1 to 7-22 | 1 |
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| Rev History/LOEP pages v to vi | 1 | Chapter 4 - Functional Checks pages 4-1 to 4-36 | 1 | Chapter 9 - Replacement Parts pages 9-1 to 9-16 | 1 |
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# Chapter 1
# Introduction

## Section 1-1
## Overview

### 1-1-1 Purpose of Chapter 1

This chapter describes important issues related to safely servicing this ultrasound machine. The service provider must read and understand all the information presented here before installing or servicing a unit.

### 1-1-2 Chapter Contents

**Table 1-1 Contents in Chapter 1**


| Section | Description | Page Number |
|---|---|---|
| 1-1 | Overview | 1-1 |
| 1-2 | Important Conventions | 1-3 |
| 1-3 | Safety Considerations | 1-7 |
| 1-4 | EMC, EMI, and ESD | 1-12 |
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### 1-1-3 Purpose of Service Manual

This Service Manual provides service information for the Vivid™ e Ultrasound Scanning System. It contains the following chapters:

1.) **Chapter 1 - Introduction:** Contains a content summary and warnings.
2.) **Chapter 2 - Pre Installation:** Contains pre-installation requirements for the Vivid™ e.
3.) **Chapter 3 - Installation:** Contains installation procedures.
4.) **Chapter 4 - Functional Checks:** Contains functional checks that are recommended as part of the installation, or as required during servicing and periodic maintenance.
5.) **Chapter 5 - :** Contains block diagrams and functional explanations of the electronics.
6.) **Chapter 6 - Service Adjustments:** Contains instructions on how to make available adjustments to the Vivid™ e.
7.) **Chapter 7 - Diagnostics/Troubleshooting:** Provides procedures for running diagnostic or related routines for the Vivid™ e.
8.) **Chapter 8 - Replacement Procedures:** Provides disassembly procedures and reassembly procedures for all changeable Field Replaceable Units (FRU).
9.) **Chapter 9 - Renewal Parts:** Contains a complete list of field replaceable parts for the Vivid™ e.
10.) **Chapter 10 - Care & Maintenance:** Provides periodic maintenance procedures for the Vivid™ e.

### 1-1-4 Typical Users of the Basic Service Manual

- Service Personnel (installation, maintenance, etc.).

- Hospital's Service Personnel
- Contractors (Some parts of Chapter 2 - Pre-Installation)

## 1-1-5 Vivid™ e Models Covered by this Manual

**Table 1-2 Vivid™ e Model Designations**

| Part Number | Description |
|---|---|
| 5171613 | Vivid™ e Console for USA |
| 5172528 | Vivid™ e Console for Argentina |
| 5171633 | Vivid™ e Console for Europe |
| 5171603 | Vivid™ e Console for China |
| 5171755 | Vivid™ e Console for Japanese |
| 5172272 | Vivid™ e Console for Australia |
| 5172286 | Vivid™ e Console for India/South Africa |
| 5183318 | Vivid™ e Console with SKD ECG |

## 1-1-6 Purpose of Operator Manual(s)

The Operator Manual(s) should be fully read and understood before operating the Vivid™ e and also kept near the unit for quick reference.

# Section 1-2
# Important Conventions

## 1-2-1 Conventions Used in Book

### Icons

Pictures, or icons, are used wherever they reinforce the printed message. The icons, labels and conventions used on the product and in the service information are described in this chapter.

### Safety Precaution Messages

Various levels of safety precaution messages may be found on the equipment and in the service information. The different levels of concern are identified by a flag word that precedes the precautionary message. Known or potential hazards are labeled in one of following ways:

**DANGER** **DANGER IS USED TO INDICATE THE PRESENCE OF A HAZARD THAT WILL CAUSE SEVERE PERSONAL INJURY OR DEATH IF THE INSTRUCTIONS ARE IGNORED.**

**WARNING** ***WARNING IS USED TO INDICATE THE PRESENCE OF A HAZARD THAT CAN CAUSE SEVERE PERSONAL INJURY AND PROPERTY DAMAGE IF INSTRUCTIONS ARE IGNORED.***

**CAUTION** **Caution is used to indicate the presence of a hazard that will or can cause minor personal injury and property damage if instructions are ignored.**

**NOTICE** **Equipment Damage Possible**

**Notice is used when a hazard is present that can cause property damage but has absolutely no personal injury risk.**

*Example***:** Disk drive will crash.

*NOTE: Notes provide important information about an item or a procedure. Information contained in a NOTE can often save you time or effort.*

## 1-2-2 Standard Hazard Icons

Important information will always be preceded by the exclamation point contained within a triangle, as seen throughout this chapter. In addition to text, several different graphical icons (symbols) may be used to make you aware of specific types of hazards that could cause harm.

**Table 1-3 Standard Hazard Icons**

| ELECTRICAL | MECHANICAL | RADIATION |
|---|---|---|
| | | |
| **LASER** | **HEAT** | **PINCH** |
| | | |

Other hazard icons make you aware of specific procedures that should be followed.

**Table 1-4 Standard Icons Indicating a Special Procedure Be Used**

| AVOID STATIC ELECTRICITY | TAG AND LOCK OUT | WEAR EYE PROTECTION |
|---|---|---|
| | | |

## 1-2-3 Product Icons

The following table describes the purpose and location of safety labels and other important information provided on the equipment.

**Table 1-5 Warnings**

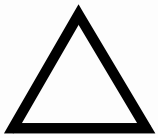
| LABEL/SYMBOL | PURPOSE/MEANING | LOCATION |
|---|---|---|
| Identification and Rating Plate | • Manufacture's name<br>• Date of manufacture<br>• Model and serial numbers<br>• Electrical ratings (Volts, Amps, phase, and frequency) | Bottom panel of the console |
| Type/Class Label | Used to indicate the degree of safety or protection. | Bottom panel of the adapter. |
| IP Code (IPX1 or IPX8)<br>IPX1: FSU-2001<br>IPX8: MKF 2-MED GP26 | Indicates the degree of protection provided by the enclosure per IEC60 529. IPX1 cannot be used in operating room environment; IPX8 can be used in operating room environment. | Bottom of Footswitch |
| | Equipment Type BF (man in the box symbol) IEC 878-02-03 indicates B Type equipment having a floating applied part. | Probe connectors |
|  | "CAUTION" The equilateral triangle is usually used in combination with other symbols to advise or warn the user. | Various |
| | ATTENTION - Consult accompanying documents is intended to alert the user to refer to the operator manual or other instructions when complete information cannot be provided on the label. | Various |
| | "CAUTION - Dangerous voltage" (the lightning flash with arrowhead in equilateral triangle) is used to indicate electric shock hazards. | Various |
| | "ON" indicates the power on position of the power switch.<br>CAUTION<br>This Power Switch DOES NOT ISOLATE Mains Supply | Stick to Power Switch |
| | "TUV" Listing and Certification Mark is used to designate conformance to nationally recognized product safety standards. The Mark bears the name and /or logo of the testing laboratory, product category, safety standard is assessed and a control number. | Bottom panel of the console |

**Table 1-5 Warnings**

| LABEL/SYMBOL | PURPOSE/MEANING | LOCATION |
|---|---|---|
| | Date of manufacture.<br>The date could be a year, year and month, or year, month and day, as appropriate. See ISO 8601 for date formates. | Rating Plate |
| | Catalog or model number. | Rating Plate |
| | Serial number | Rating Plate |
| | Direct Current.<br>For products to be powered from a DC supply. | Rating Plate |
| | Type CF Defib-Proof Applied Part (heart in the box with paddle) symbolis in accordance with IEC 60878-02-06. | ECG Module |
| | This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment. | Rating Plate |
| | When closing the LCD cover, use caution to avoid injuring hands or fingers as there is a closing mechanism which allows the LCD cover to automatically close. | Rating Plate |

# Section 1-3
# Safety Considerations

## 1-3-1 Introduction

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual, violates safety standards of design, manufacture and intended use of the equipment.

## 1-3-2 Human Safety

Operating personnel must not remove the system covers.
Servicing should be performed by authorized personnel only.
Only personnel who have participated in a Vivid™ e Training are authorized to service the equipment.

## 1-3-3 Mechanical Safety

**WARNING** ***Ultrasound probes are highly sensitive medical instruments that can easily be damaged by improper handling. Use care when handling and protect from damage when not in use. Do not use a damaged or defective probe. Failure to follow these precautions can result in serious injury and equipment damage.***

**WARNING** ***Never use a probe that has fallen to the floor. Even if it looks ok, it may be damaged.***

**CAUTION** **The Vivid™ e weights 4.6kg or more, depending on installed peripherals, when ready for use. To avoid possible injury and equipment damage:**

**ALWAYS:**

- **Use the handle to move the system.**
- **Do not let the system strike walls or door frame.**
- **Limit movement to a slow careful walk.**

*NOTE: Special care should be taken when transporting the unit in a vehicle:*

- *Before transporting, place the system in its special storage case.*
- *Ensure that the system is firmly secured while inside the vehicle.*
- *Secure system with straps or as directed otherwise to prevent motion during transport.*
- Prevent vibration damage by driving cautiously. Avoid unpaved roads, excessive speeds, and erratic stops or starts.

## 1-3-4 Electrical Safety

To minimize shock hazard, the equipment chassis must be connected to an electrical ground. The system is equipped with a three-conductor AC power cable. This must be plugged into an approved electrical outlet with protective ground.

The power outlet used for this equipment should not be shared with other types of equipment.

Both the system power cable and the power connector meet international electrical standards.

## 1-3-5 Labels Locations

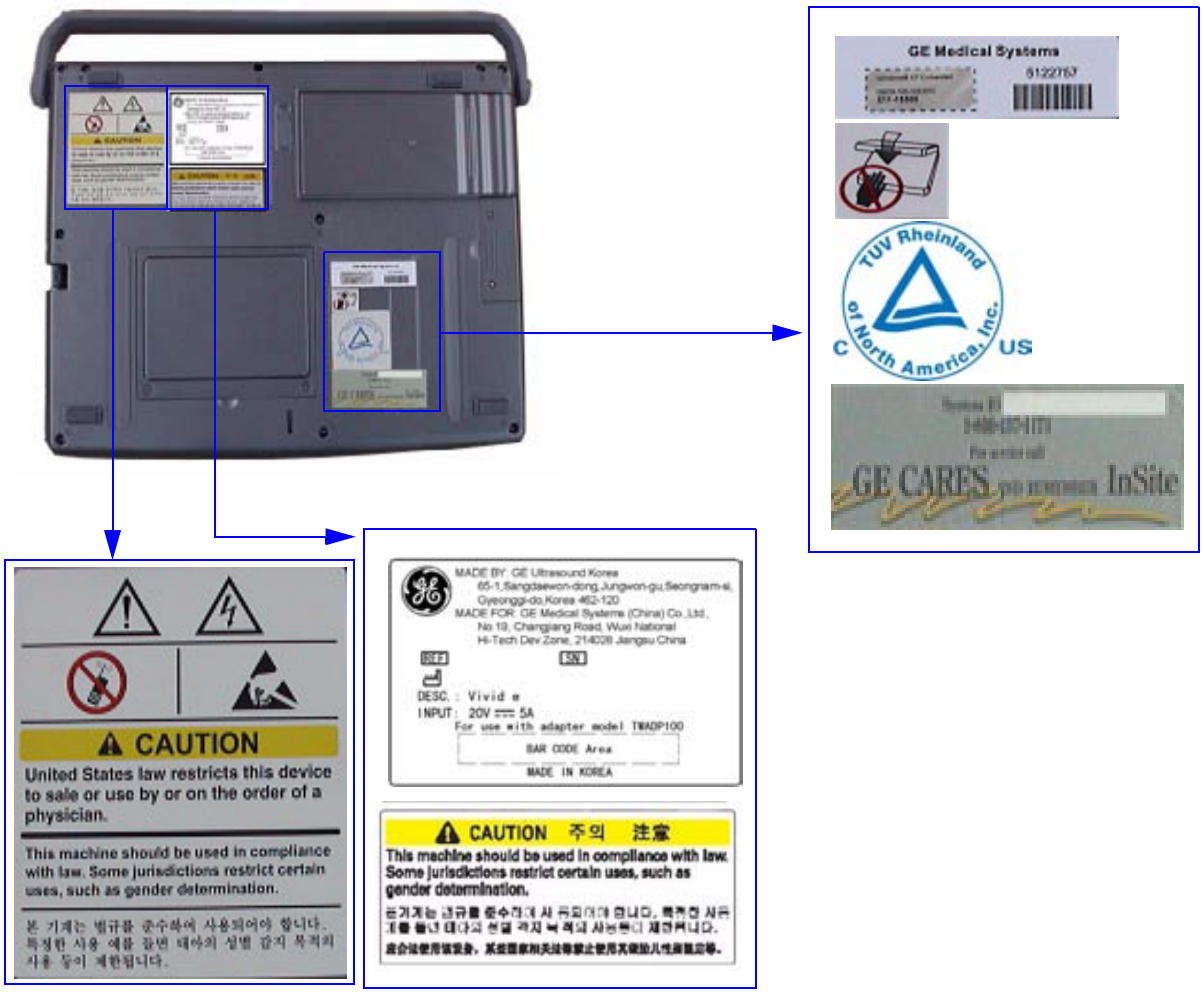

GE Medical Systems
5122757
TUV Rheinland of North America, Inc.
C US
GE CARES InSite
CAUTION
United States law restricts this device to sale or use by or on the order of a physician.
This machine should be used in compliance with law. Some jurisdictions restrict certain uses, such as gender determination.
MADE BY: GE Ultrasound Korea
MADE FOR: GE Medical Systems (China) Co.,Ltd.,
DESC. : Vivid e
INPUT: 20V 5A
For use with adapter model TWADP100
BAR CODE Area
MADE IN KOREA
CAUTION 주의 注意
This machine should be used in compliance with law. Some jurisdictions restrict certain uses, such as gender determination.

**Figure 1-1 Label Location**

## 1-3-5 Labels Locations (cont'd)

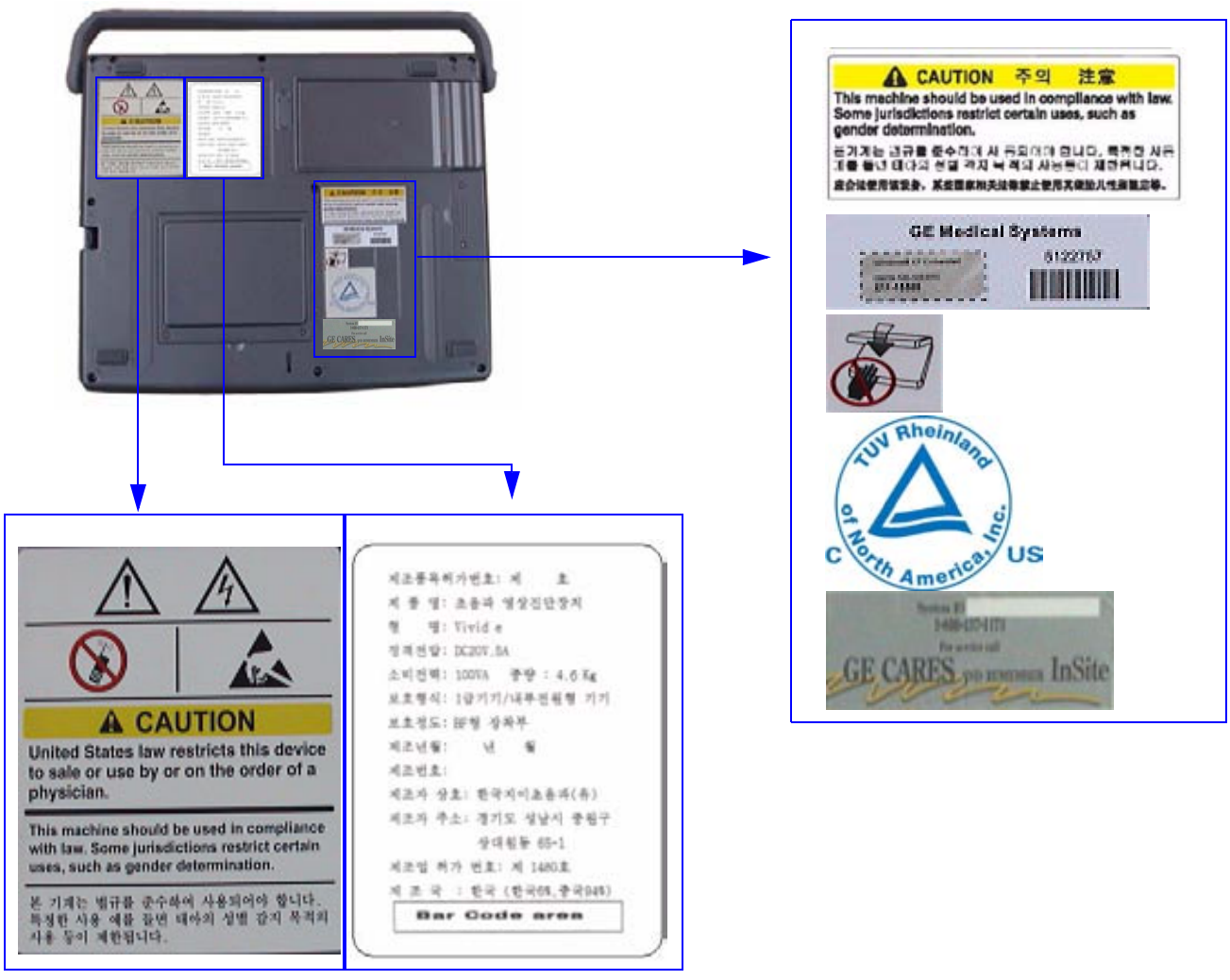

CAUTION 주의 注意
This machine should be used in compliance with law. Some jurisdictions restrict certain uses, such as gender determination.
GE Medical Systems
TUV Rheinland of North America, Inc.
C US
GE CARES InSite
CAUTION
United States law restricts this device to sale or use by or on the order of a physician.
This machine should be used in compliance with law. Some jurisdictions restrict certain uses, such as gender determination.
Bar Code area

**Figure 1-2 Label Location (Korea)**

## 1-3-6 Battery Safety

To avoid the risk of injury, follow the warning and cautions to make sure that the battery does not burst, ignite, or generate heat of fumes.

**WARNING**

- **The battery has a safety device. Do not disassemble or alter the battery.**
- **Charge the batteries only when the ambient temperature is between 0° and 50° C (32° and 122° F) and discharge the batteries between 0° and 60° C (32° and 140° F).**
- **Do not short-circuit the battery by directly connecting the negative terminals with metal objects.**
- **Do not heat the battery or discard it in a fire.**
- **Do not expose the battery to temperature over 60° C (140° F). Keep it away from fire and other heat sources.**
- **Do not charge the battery near a heat source, such as a fire or heater.**
- **Do not leave the battery in direct sunlight.**
- **Do not drop packs from height to prevent them from possible malfunction damage.**
- **Do not pierce the battery with a sharp object, hit it, or step on it.**
- **Do not use a damaged battery.**
- **Do not solder a battery.**
- **Do not connect the battery to an electrical power outlet.**
- **Do not contact PCM directly to prevent packs from ESD damage.**
- **In the case of longer non-use of the Vivid™ e, remove the battery is necessary.**

**CAUTION** **To avoid the battery bursting, igniting, or fumes from the battery causing equipment damage, observe the following precautions:**

- **Do not immerse the battery in water or allow it to get wet.**
- **Do not put the battery into a microwave oven or pressurized container.**
- **If the battery leaks or emits an odor, remove it from all possible flammable sources.**
- **If the battery emits an odor or heat, is deformed or discolored, or in a way appears abnormal during use, recharging or storage, immediately remove it and stop using it. If you have any questions about the battery, consult GE or your local representative.**
- **Short term (less than one month) storage of battery pack:**
    - **Store the battery in a temperature range between 0° C (32° F) and 50° C (122°F).**
- **Use only GE recognized batteries.**
- **In case of the long term (3 months or more) storage:**
    - **Store the battery in a temperature range of -20° C (-4° F) and 45° C (113°F).**
    - **When charging for the first time after long-term storage. Recover such packs to original performance through repeating several cycles of full charging and discharging.**
    - **When store packs for more than 6 months, charge at lease once charging require per 6 months to prevent leakage and deterioration in performance due to self-discharging.**

**NOTICE** The battery shall be shipped in about 30% charged state. Those packs have to be fully charged and discharged up to 3 times to utilize Li-Ion smart packs before use.

## 1-3-7 Dangerous Procedure Warnings

Warnings, such as the examples below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

**DANGER** **DANGEROUS VOLTAGES, CAPABLE OF CAUSING DEATH, ARE PRESENT IN THIS EQUIPMENT. USE EXTREME CAUTION WHEN HANDLING, TESTING AND ADJUSTING.**

**WARNING** ***EXPLOSION WARNING***

***DO NOT OPERATE THE EQUIPMENT IN AN EXPLOSIVE ATMOSPHERE. OPERATION OF ANY ELECTRICAL EQUIPMENT IN SUCH AN ENVIRONMENT CONSTITUTES A DEFINITE SAFETY HAZARD.***

**WARNING** ***DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT***

***BECAUSE OF THE DANGER OF INTRODUCING ADDITIONAL HAZARDS, DO NOT INSTALL SUBSTITUTE PARTS OR PERFORM ANY UNAUTHORIZED MODIFICATION OF THE EQUIPMENT.***

**WARNING** ***SHUT DOWN FORCEDLY OR PLUG IN/OUT ACDC INVALID MAY CAUSE THE DAMAGE OF SYSTEM FILES.***

## 1-3-8 Lockout/Tagout Requirements (For USA Only)

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the electrical Mains plug.

## 1-3-9 Returning/Shipping Probes and Repair Parts

Equipment being returned must be clean and free of blood and other infectious substances.

GEMS policy states that body fluids must be properly removed from any part or equipment prior to shipment. GEMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or an ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

*NOTE: The US Department of Transportation (DOT) has ruled that "items that were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care" are "regulated medical waste" for transportation purposes and must be transported as a hazardous material.*

*NOTE: The USER/SERVICE staff should dispose all the waste properly as per federal, state, and local waste disposal regulation.*

# Section 1-4
# EMC, EMI, and ESD

## 1-4-1 Electromagnetic Compatibility (EMC)

Electromagnetic compatibility describes a level of performance of a device within its electromagnetic environment. This environment consists of the device itself and its surroundings including other equipment, power sources and persons with which the device must interface. Inadequate compatibility results when a susceptible device fails to perform as intended due interference from its environment or when the device produces unacceptable levels of emission to its environment. This interference is often referred to as radio–frequency or electromagnetic interference (RFI/EMI) and can be radiated through space or conducted over interconnecting power of signal cables. In addition to electromagnetic energy, EMC also includes possible effects from electrical fields, magnetic fields, electrostatic discharge and disturbances in the electrical power supply.

## 1-4-2 CE Compliance

The Vivid™ e unit conforms to all applicable conducted and radiated emission limits and to immunity from electrostatic discharge, radiated and conducted RF fields, magnetic fields and power line transient requirements.

For applicable standards refer to the Safety Chapter in the Basic User Manual.

***NOTE:*** ***For CE Compliance, it is critical that all covers, screws, shielding, gaskets, mesh, clamps, are in good condition, installed tightly without skew or stress. Proper installation following all comments noted in this service manual is required in order to achieve full EMC performance.***

## 1-4-3 Electrostatic Discharge (ESD) Prevention

⚠ **WARNING** ***DO NOT TOUCH ANY BOARDS WITH INTEGRATED CIRCUITS PRIOR TO TAKING THE NECESSARY ESD PRECAUTIONS:***

***1.FOLLOW GENERAL GUIDELINES FOR HANDLING OF ELECTROSTATIC SENSITIVE EQUIPMENT.***

# Section 1-5
# Customer Assistance

## 1-5-1 Contact Information

If this equipment does not work as indicated in this service manual or in the User Manual, or if you require additional assistance, please contact the local distributor or appropriate support resource, as listed below.

Prepare the following information before you call:

- System ID serial number.
- Software version.

**Table 1-6 Phone Numbers for Customer Assistance**

| Location | Phone Number | |
|---|---|---|
| USA<br>GE Medical Systems<br>Ultrasound Service Engineering<br>9900 Innovation Drive<br>Wauwatosa, WI 53226 | Service: On-site<br><br>Service: Parts<br><br>Applications support | 1-800–437–1171<br><br>1-800-558-2040<br><br>1-800-682-5327 or 1-262-524-5698 |
| Canada | | 1-800-668-0732 |
| Latin America | Service<br><br>Applications support | 1-800-321-7937<br><br>1-262-524-5698 |
| Europe<br>GE Ultraschall Deutschland GmbH& Co. KG<br>BeethovenstraBe 239<br>Postfach 11 05 60, D-42665 Solingen<br>Germany | Phone: +33 (0)130-831-300 (General Imaging and Cardiac)<br><br>Fax: +49 (0)212-2802-431 | |
| Asia (Singapore)<br>GE Ultrasound Asia<br>Service Department - Ultrasound<br>298 Tiong Bahru Road #15-01/06<br>Central Plaza<br>Singapore 169730 | Tel: +65 291-8528<br><br><br><br>Fax: +65 6291-7006 | |
| Japan Support Center | Phone: 81-42-648-2944<br>Fax: 81-42-648-2905 | |

## 1-5-2 System Manufacturer

**Table 1-7 System Manufacturer**

| Manufacturer | Phone Number |
|---|---|
| GE Medical Systems (China) Co., Ltd.<br>No.19, Changjiang Road, Wuxi, Jiangsu, P.R. China 214028 | TEL: +86 510-85225888<br>FAX: +86 510-85226688 |
| GE Ultrasound Korea:<br>65-1, Sangdaewon-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do, Korea 462-120 | |

# Chapter 2
# Pre Installation

## Section 2-1
## Overview

### 2-1-1 Purpose of this chapter 2

This chapter provides the information required to plan and prepare for the installation of a Vivid e. Included are descriptions of the facility and electrical needs to be met by the purchaser of the unit.

### 2-1-2 Chapter Contents

**Table 2-8 Contents in Chapter 2**


| Section | Description | Page Number |
|---|---|---|
| 2-1 | Overview | 2-1 |
| 2-2 | General Console Requirements | 2-2 |
| 2-3 | Facility Needs | 2-6 |

# Section 2-2
# General Console Requirements

## 2-2-1 Console Environmental Requirements

**Table 2-9 Environmental Requirements for Vivid e Scanners**

| | Operational | Storage | Transport |
|---|---|---|---|
| **Temperature** | 10 - 40 degree C | -5 - 50 degree C | -5 - 50 degree C |
| **Humidity** | 30 - 75%<br>non-condensing | 10 - 90%<br>non-condensing | 10 - 90%<br>non-condensing |
| **Pressure** | 700 - 1060hPa | 700 - 1060hPa | 700 - 1060hPa |
| Temperatures in degree C, conversion to degree F =(degree C*(9/5) + 32) | | | |

### 2-2-1-1 Lighting

Bright light is needed for system installation, updates and repairs. However, operator and patient comfort may be optimized if the room light is subdued and indirect. Therefore a combination lighting system (dim/bright) is recommended. Keep in mind that lighting controls and diameters can be a source of EMI which could degrade image quality. These controls should be selected to minimize possible interface.

## 2-2-2 Electrical Requirements

*NOTE: GE Medical Systems requires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system.*

**Sites with a mains power system with defined Neutral and Live:**

The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the Ultrasound outlet.

**Sites with a mains power system without a defined Neutral:**

The dedicated line shall consist of one phase (two lines), not shared with any other circuit, and a full size ground wire from the distribution panel to the Ultrasound outlet.

*Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.*

### 2-2-2-1 Vivid e Power Requirements

**Table 2-10 Electrical Specifications for Vivid e**

| Adapter | Voltage | Power | Current | Frequency |
|---|---|---|---|---|
| TWADP100 | 100-240 VAC | 130VA max. | 1.3 A (max.) | 50/ 60HZ |

### 2-2-2-2 Inrush Current

Inrush current is not a factor to consider due to the inrush current limiting properties of the power supplies.

**Table 2-11 Inrush Current**

| Voltage | Inrush Current | |
|---|---|---|
| | Console Only | Console with all peripherals |
| 100V | 0.38A | 0.41A |
| 240V | 0.20A | 0.21A |

### 2-2-2-3 Site Circuit Breaker

It is recommended that the branch circuit breaker for the machine be readily accessible.

### 2-2-2-4 Site Power Outlets

A dedicated AC power outlet must be within reach of the unit without extension cords. Other adequate outlets for the external peripherals, medical and test equipment needed to support this unit must also be present within 1 m (3.2 ft.) of the unit. Electrical installation must meet all current local, state, and national electrical codes.

### 2-2-2-5 Unit Power Plug

If the unit arrives without a power plug, or with the wrong plug, you must contact your GE dealer or the installation engineer must supply what is locally required.

### 2-2-2-6 Power Stability Requirements

**Voltage drop-out**

Max 10 ms.

**Power Transients**

(All applications)

Less than 25% of nominal peak voltage for less than 1 millisecond for any type of transient, including line frequency, synchronous, asynchronous, or aperiodic transients.

## 2-2-3 EMI Limitations

Ultrasound machines are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transient in the air wiring. They also generate EMI. The Vivid e complies with limits as stated on the EMC label. However there is no guarantee that interface will not occur in a particular installation.

Possible EMI sources should be identified before the unit is installed.

Electrical and electronic equipment may produce EMI unintentionally as the result of defect.

These sources include:

- medical lasers,
- scanners,
- cauterizing guns,
- computers,
- monitors,
- fans,
- gel warmers,
- microwave ovens,
- light dimmers,
- portable phones.

The presence of a broadcast station or broadcast van may also cause interference.

See Table 2-12 for EMI Prevention tips.

**Table 2-12 EMI Prevention/abatement**

| EMI Rule | Details |
|---|---|
| Be aware of RF sources | Keep the unit at least 5 meters or 15 feet away from other EMI sources. Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals. |
| Ground the unit | Poor grounding is the most likely reason a unit will have noisy images. Check grounding of the power cord and power outlet. |
| Replace all screws, RF gaskets, covers, cores | After you finish repairing or updating the system, replace all covers and tighten all screws. Any cable with an external connection requires a magnet wrap at each end. Install the shield over the front of card cage. Loose or missing covers or RF gaskets allow radio frequencies to interfere with the ultrasound signals. |
| Replace broken RF gaskets | If more than 20% or a pair of the fingers on an RF gasket are broken, replace the gasket. Do not turn on the unit until any loose metallic part is removed. |
| Do not place labels where RF gaskets touch metal | Never place a label where RF gaskets meet the unit. Otherwise, the gap created will permit RF leakage. Or, if a label has been found in such a position, move the label. |
| Use GE specified harnesses and peripherals | The interconnect cables are grounded and require ferrite beads and other shielding. Also, cable length, material, and routing are all important; do not change from what is specified. |
| Take care with cellular phones | Cellular phones may transmit a 5 V/m signal; that could cause image artifacts. |
| Properly dress peripheral cables | Do not allow cables to lie across the top of the card cage or hang out of the peripheral bays. Loop the excess length for peripheral cables inside the peripheral bays. Attach the monitor cables to the frame. |

## 2-2-4 Scan Probe Environmental Requirements

Operation:10° to 40° C

Storage:-10° to 60° C

*NOTE: Temperature in degrees C. Conversion to Degrees F = (Degrees C * (9/5) + 32).*

**NOTICE SYSTEMS AND ELECTRONIC PROBES ARE DESIGNED FOR STORAGE TEMPERATURES OF -10 TO + 60 degrees C. WHEN EXPOSED TO LARGE TEMPERATURE VARIATIONS, THE PRODUCT SHOULD BE KEPT IN ROOM TEMPERATURE FOR 10 HOURS BEFORE USE.**

# Section 2-3
# Facility Needs

## 2-3-1 Recommended Ultrasound Room Layout

### 2-3-1-1 Purchaser Responsibilities

The work and materials needed to prepare the site is the responsibility of the purchaser. Delay, confusion, and waste of manpower can be avoided by completing pre installation work before delivery. User the Pre Installation checklist to verify that all needed steps have been taken,
Purchaser reasonability includes:

- Procuring the materials required.
- Completing the preparations before delivery of the ultrasound system.
- Paying the costs for any alternations and modifications not specifically provided in the sales contract.

*NOTE: All electrical installation that are preliminary to the positioning of the equipment at the site prepared for the equipment must be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, products involved (and the accompanying electrical installations) are highly sophisticated and special engineering competence is required. All electrical work on these product must comply with the requirements of applicable electrical codes. The purchaser of GE equipment must only utilize qualified personnel to perform electrical servicing on the equipment.*

The desire to use a non-listed or customer provided product or to place an approved product further from the system than the interface kit allows presents challenges to the installation team. To avoid delays during installation, such variances should be made known to the individuals or group performing the installation at the earliest possible date (preferable prior to purchase).
The ultrasound suite must be clean prior to delivery of the machine. Carpet is not recommended because it collects dust and creates static. Potential sources of EMI (electromagnetic interference) should also be investigated before delivery. Dirt, static, and EMI can negatively impact system.

## 2-3-2 Required Features

*NOTE: GE Medical Systems requires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system.*

**Sites with a mains power system with defined Neutral and Live:**

The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the Ultrasound outlet.

**Sites with a mains power system without a defined Neutral:**

The dedicated line shall consist of one phase (two lines), not shared with any other circuit, and a full size ground wire from the distribution panel to the Ultrasound outlet.

*Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.*

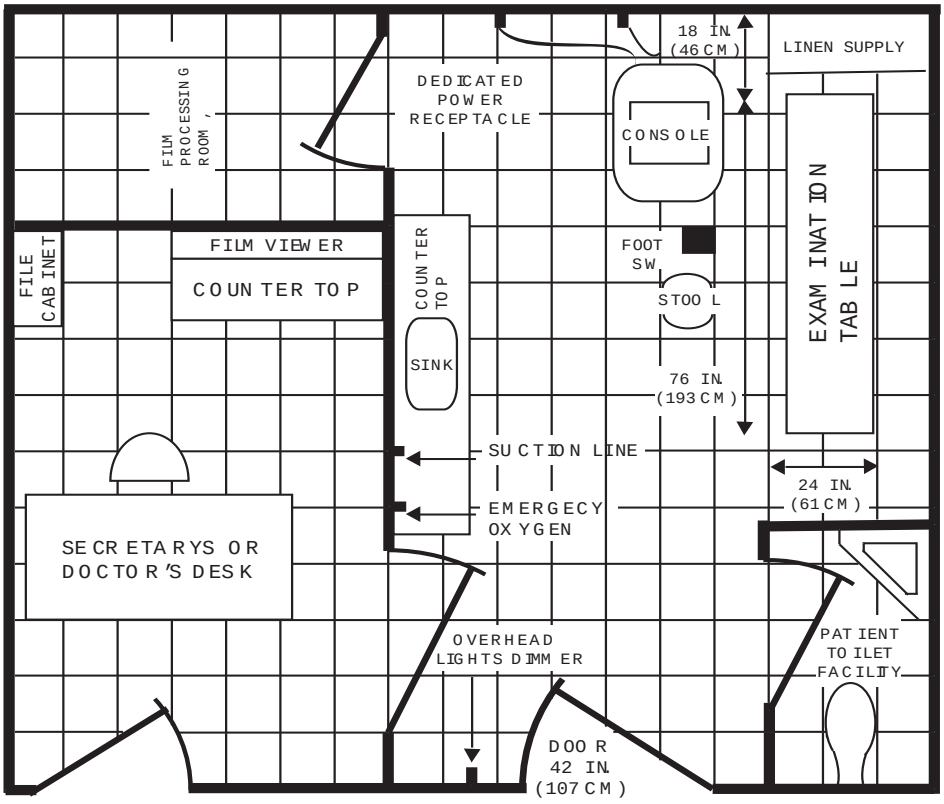
- Dedicated single branch power outlet of adequate amperage meeting all local and national codes which is located less than 2.5 m (8 ft.) from the unit's proposed location
- Door opening is at least 76 cm (30 in) wide
- Proposed location for unit is at least 0.2m (0.67 ft.) from the wall for cooling
- Power outlet and place for any external peripheral are within 2 m (6.5 ft.) of each other with peripheral within 1 m of the unit to connect cables.
- Power outlets for other medical equipment and gel warmer
- Power outlets for test equipment and modem within 1 m (3.2 ft.) of unit
- Clean and protected space to store transducers (in their cases or on a rack)
- Material to safely clean probes (done with a plastic container, never metal)

## 2-3-3 Desirable Features

- Door is at least 92 cm (3 ft.) wide
- Circuit breaker for dedicated power outlet is easily accessible
- Sink with hot and cold water
- Receptacle for bio–hazardous waste, like used probe sheaths
- Emergency oxygen supply
- Storage for linens and equipment
- Nearby waiting room, lavatory, and dressing room
- Dual level lighting (bright and dim)
- Lockable cabinet ordered by GE for its software and proprietary manuals.

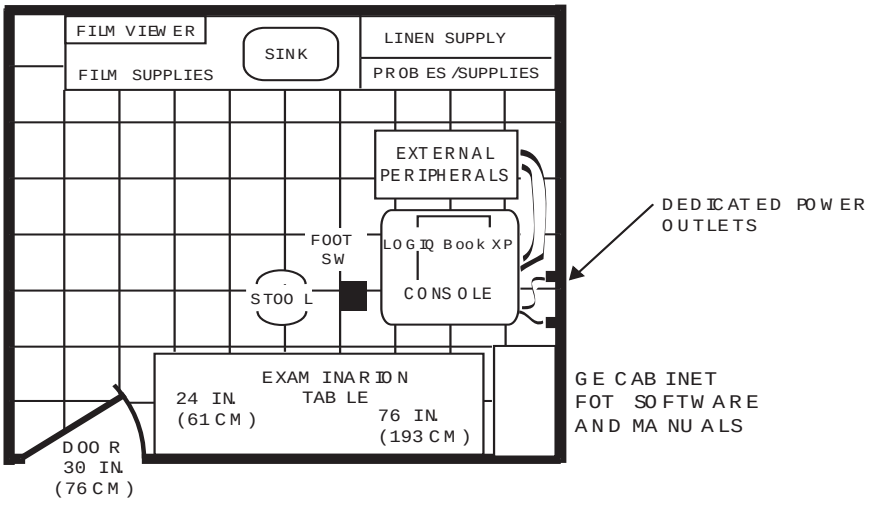
### 2-3-3-1 Recommended and Alternate Ultrasound Room Layout

Recommended standard floor plan and a minimal floor plan for ultrasound equipment:




A 14 by 17 foot Recommended Floor Plan

Scale: Each square equals one square foot




An 8 by 10 foot Minimal Floor Plan

**Figure 2-3 RECOMMENDED ULTRASOUND ROOM LAYOUT**

## 2-3-4 Networking Pre-installation Requirements

### 2-3-4-1 Stand Alone Scanner (without Network Connection)

None.

### 2-3-4-2 Scanner Connected to Hospital's Network

Supported networks:

Wireless LAN

### 2-3-4-3 Purpose of DICOM Network Function

DICOM services provide the operator with clinically useful features for moving images and patient information over a hospital network. Examples of DICOM services include the transfer of images to workstations for viewing or transferring images to remote printers. As an added benefit, transferring images in this manner frees up the on-board monitor and peripherals, enabling viewing to be done while scanning continues. With DICOM, images can be archived, stored, and retrieved faster, easier, and at a lower cost.

### 2-3-4-4 DICOM Option Pre-installation Requirements

To configure the Vivid e to work with other network connections, the site's network administrator must provide some necessary information.

Information must include:

- A host name, local port number, AE Title, IP address and Net Mask for the Vivid e.
- The IP addresses for the default gateway and other routers at the site for ROUTING INFORMATION.
- The host name, IP address, port and AE Title for each device the site wants connected to the Vivid e for DICOM APPLICATION INFORMATION. A field for the make (manufacturer) and the revision of the device, is also included. This information may be useful for solving errors.

### 2-3-4-4 DICOM Option Pre-installation Requirements (cont'd)

.

Vivid e
**Host Name**

**Local Port**

**IP Address** . . .

**AE Title**

**Net Mask** . . .

**ROUTING INFORMATION**

**Destination IP Addresses**

**GATEWAY IP Addresses**

**Default** . . .

**ROUTER1** . . .

**ROUTER2** . . .

**ROUTER3** . . .

**DICOM APPLICATION INFORMATION**

| | NAME | MAKE/REVISION | AE TITLE | IP ADDRESSES | PORT |
|---|---|---|---|---|---|
| Store 1 | | | | . . . | |
| Store 2 | | | | . . . | |
| Store 3 | | | | . . . | |
| Store 4 | | | | . . . | |
| Store 5 | | | | . . . | |
| Store 6 | | | | . . . | |
| Worklist | | | | . . . | |
| Storage Commit | | | | . . . | |
| MPPS | | | | . . . | |

**Figure 2-4 Worksheet for DICOM Network Information**

# Chapter 3
# Installation

## Section 3-1
## Overview

### 3-1-1 Purpose of Chapter 3

This chapter contains information needed to install the unit. Included are references to a procedure that describes how to receive and unpack the equipment and how to file a damage or loss claim.
How to prepare the facility and unit of the actual installation, and how to check and test the unit, probes, and external peripherals for electrical safety are included in this procedure. Also included in this section are guidelines for transporting the unit to a new site.

**Table 3-13 Contents in Chapter 3**


| Section | Description | Page Number |
|---|---|---|
| 3-1 | Overview | 3-1 |
| 3-2 | Receiving and Unpacking the Equipment | 3-3 |
| 3-3 | Packing the Equipment | 3-6 |
| 3-4 | Preparing for Installation | 3-7 |
| 3-5 | Completing the Installation | 3-8 |
| 3-6 | System Configuration | 3-11 |
| 3-7 | Software/Option Configuration | 3-22 |
| 3-8 | Connectivity Installation Worksheet | 3-23 |
| 3-9 | Loading Base Image Software | 3-24 |
| 3-10 | Software Version check out | 3-27 |
| 3-11 | Paperwork | 3-28 |


### 3-1-2 Average Installation Time

**Table 3-14 Average Installation Time**

| Description | Average Installation Time | Comments |
|---|---|---|
| Unpacking the scanner | 20 minutes | |
| Scanner wo/options | 30 minutes | Dependent on the configuration that is required |
| DICOM Option | 30 minutes | Dependent on the amount of configuration |

The Vivid™ e installation and functional checkout will take approximately one hour. Vivid™ e consoles with optional equipment may take slightly longer.

## 3-1-3 Installation Warnings

11.) There are no operator serviceable components. To prevent shock, do not remove any covers or panels. Should problems or malfunctions occur, unplug the power cord. Only qualified service personnel should carry out servicing.

*NOTE: For information regarding packing labels, refer to LABELS ON PACKAGE.*

12.) After being transported, the unit may be very cold or hot. If this is the case, allow the unit to acclimate before you turn it on. It requires one hour for each 2.5°C increment it's temperature is below 10°C or above 40°C.

**DANGER Equipment damage possibility. Turning the system on without acclimation after arriving at site may cause the system to be damaged.**

**Table 3-15 Time for Settlement**

| °C | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| °F | 140 | 131 | 122 | 113 | 104 | 95 | 86 | 77 | 68 | 59 | 50 | 41 | 32 | 23 | 14 | 5 | -4 | -13 | -22 | -31 | -40 |
| hrs | 8 | 6 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |

## 3-1-4 Safety Reminders

**DANGER WHEN USING ANY TEST INSTRUMENT THAT IS CAPABLE OF OPENING THE AC GROUND LINE (I.E., METER'S GROUND SWITCH IS OPEN), DON'T TOUCH THE UNIT!**

**CAUTION If the unit is very cold or hot, do not turn on its power until it has had a chance to acclimate to its operating environment.**

**DANGER To prevent electrical shock, connect the unit to a properly grounded power outlet. Do not use a three to two prong adapter. This defeats safety grounding.**

**DANGER Do not operate this unit unless all board covers are securely in place.**

**DANGER OPERATOR MANUAL(S)**
**The User Manual(s) should be fully read and understood before operating the Vivid™ e and kept near the unit for quick reference.**

**DANGER ACOUSTIC OUTPUT HAZARD**
**Although the ultrasound energy transmitted from the Vivid™ e probe is within FDA limits, avoid unnecessary exposure. Ultrasound energy can produce heat and mechanical damage**

# Section 3-2
# Receiving and Unpacking the Equipment

When a new system arrives, check that any components are not damaged and are not in short supply. If shipping damage or shortage occurs, contact the address shown in Chapter 1.

1.) Cut the four PLASTIC BANDs.
2.) Cut the adhesive tape and open top covers of paper carton.

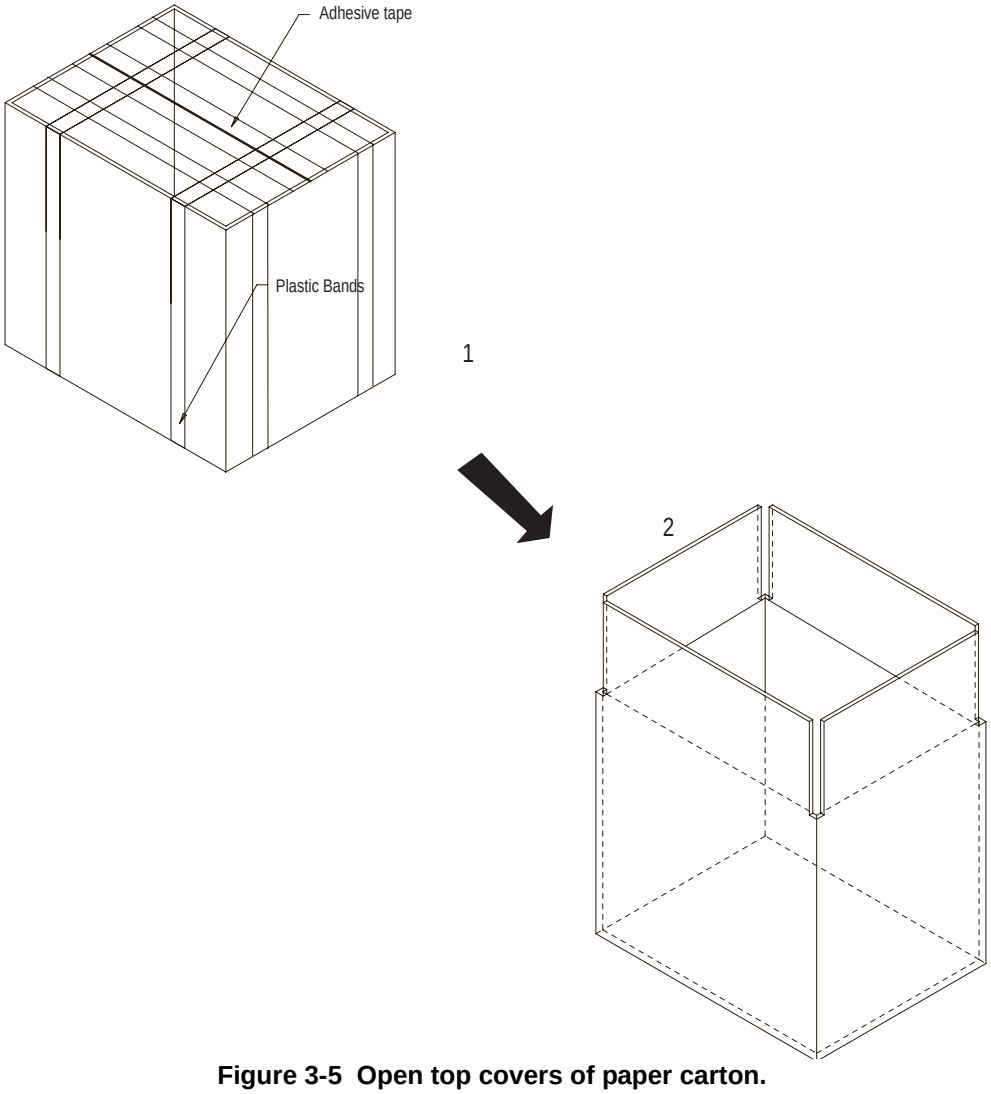



**Figure 3-5 Open top covers of paper carton.**

## Section 3-2 Receiving and Unpacking the Equipment (cont'd)

3.) Take out the Paper pad.
4.) Take out console together with 2 interleavers from console package.
5.) Take out the interleavers beside Accessories Package.
6.) Take out Accessories Package.

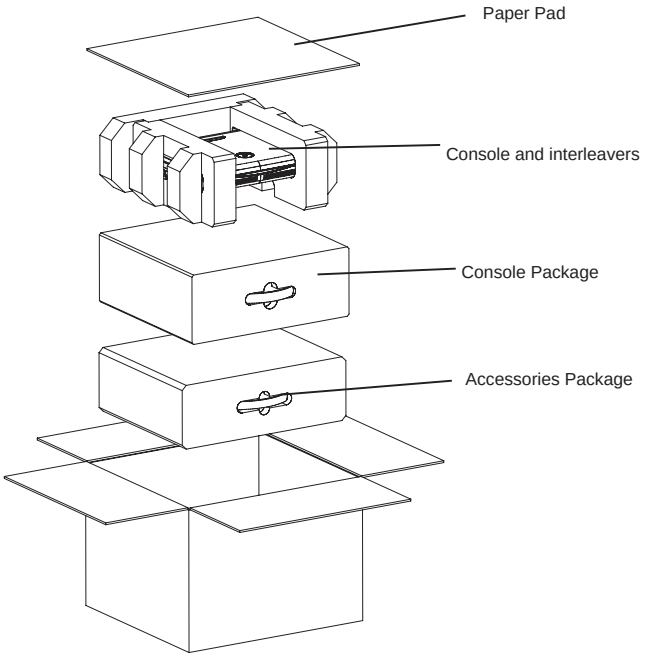



**Figure 3-6 Unpacking the equipment**

**CAUTION** **Do not lift the unit by the rubber band. Equipment damage may result.**

## Section 3-2 Receiving and Unpacking the Equipment (cont'd)

7.) Remove 2 interleavers.
8.) Remove plastic bag.

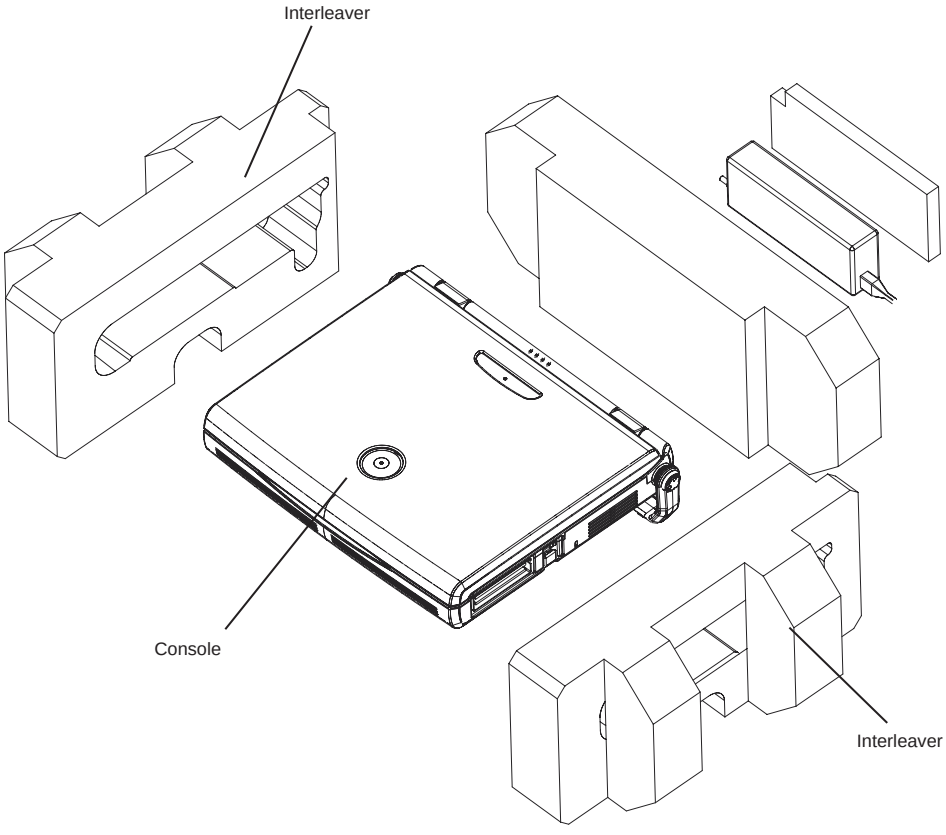



**Figure 3-7 Removing interleavers and plastic bag**

## Section 3-2 Receiving and Unpacking the Equipment (cont'd)

*NOTE: Check the shipping container for special instructions. Verify that the container is intact. In some cases a secondary container may be used. If so, ask the carrier for unpacking instructions.*

**Figure 3-8 Labels on Package**

**CAUTION Please carefully unpack the system, and do not dispose the package of Vivid™ e, so that it can be reused for service.**

### 3-2-1 Moving into Position

**CAUTION Do not lift the unit by the rubber band. Use handle to move system.**

**CAUTION Equipment Damage Possibility. Lifting the console by holding covers may damage the covers. Do not lift the console by holding any covers.**

In general, a single adult can move the Vivid™ e. Before moving, store all loose parts in original accessory box or in back pack. Return probes to original box.

## Section 3-3 Packing the Equipment

Please pack Vivid™ e in the reverse order of unpacking.

# Section 3-4
# Preparing for Installation

## 3-4-1 Verify Customer Order

Compare items received by the customer to that which is listed on the delivery order. Report any items that are missing, back ordered or damaged.

## 3-4-2 Physical Inspection

### 3-4-2-1 System Voltage Settings

- Verify that the scanner is set to the correct voltage. The Voltage settings for the Vivid™ e Scanner is found on a label located on the AC adapter.
- 220-240VAC(China); 100-120VAC(USA/Japan); 220-240VAC(Europe, Latin America).

**WARNING** ***Connecting a Vivid™ e scanner to the wrong voltage level will most likely destroy the scanner.***

## 3-4-3 EMI Protection

This Unit has been designed to minimize the effects of Electro Magnetic Interference (EMI). Many of the covers, shields, and screws are provided primarily to protect the system from image artifacts caused by this interference. For this reason, it is imperative that all covers and hardware are installed and secured before the unit is put into operation.

# Section 3-5
# Completing the Installation

## 3-5-1 Power On / Boot Up

*NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.*

### 3-5-1-1 Scanner Power On

Lower the handle. Plug the AC adapter output connector into the system DC input port (located on the system's rear panel) with the arrow side upward. Plug the AC adapter power cord into a grounded, protective earth outlet.

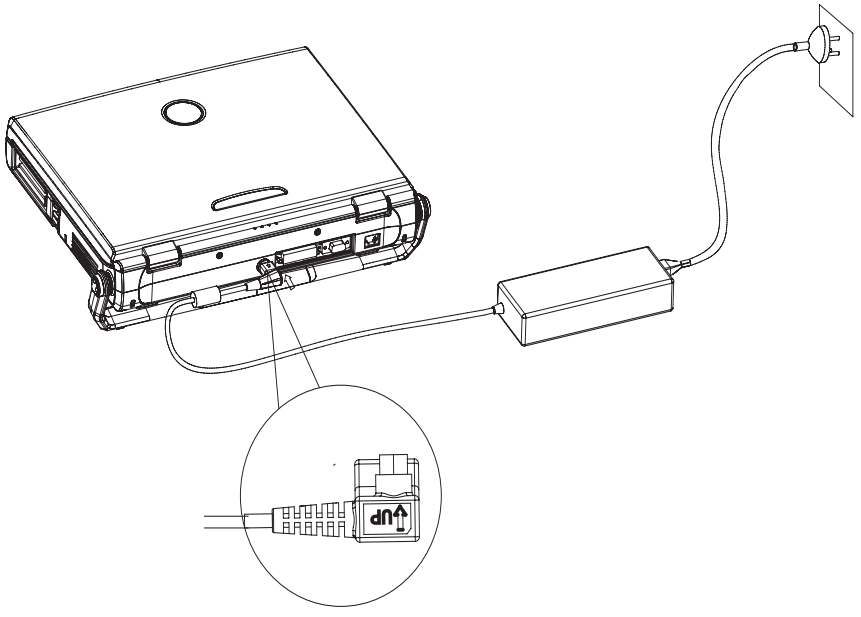



**Figure 3-9 Connect AC adapter**

When power is applied to the scanner, power is distributed to the Cooling Unit, Control Panel, LCD, Peripherals and the Back-end Processor.

.

⚠ **CAUTION The system should rest on the handle to allow an air gap to prevent overheating.**

### 3-5-1-2 Turn on the system

Press the ***Power On/Off*** switch at the front of the system once.

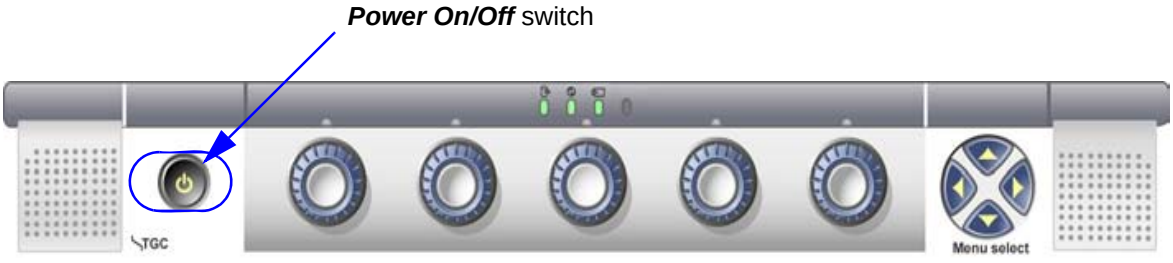



**Figure 3-10 Power On/Off Switch**

When the ***Power On/Off*** switch on the Control Panel is pressed once, the Back-end Processor starts and the software code is distributed to initiate the scanner.

No status messages are displayed during this process.

## 3-5-2 Power Off/ Shutdown

*NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.*

### 3-5-2-1 Back-end Processor Power Down

To power down the system:

1.) Press the ***Power On/Off*** switch at the front of the system once.
2.) The System-Exit window is displayed.

**Figure 3-11 System Exit Window**

3.) Using the Trackball or Select key, select Shutdown.
4.) The shutdown process takes a few seconds and is complete when the power status LED is turned off.
5.) Disconnect the probes.Clean or disinfect all probes as necessary. Store them in their shipping cases to avoid damage.
6.) Close LCD cover.

#### 3-5-2-2 Scanner Shutdown

Disconnect the Mains Power Cable if necessary. *For example:* Relocating the scanner.

## 3-5-3 Transducer Connection

1.) Carefully open the system LCD display, plug the probe connector into the probe port, then lock the probe latch upward.

*NOTE: Please ensure that the probe latch is in an unlocked position before you connect the probe to the system.*

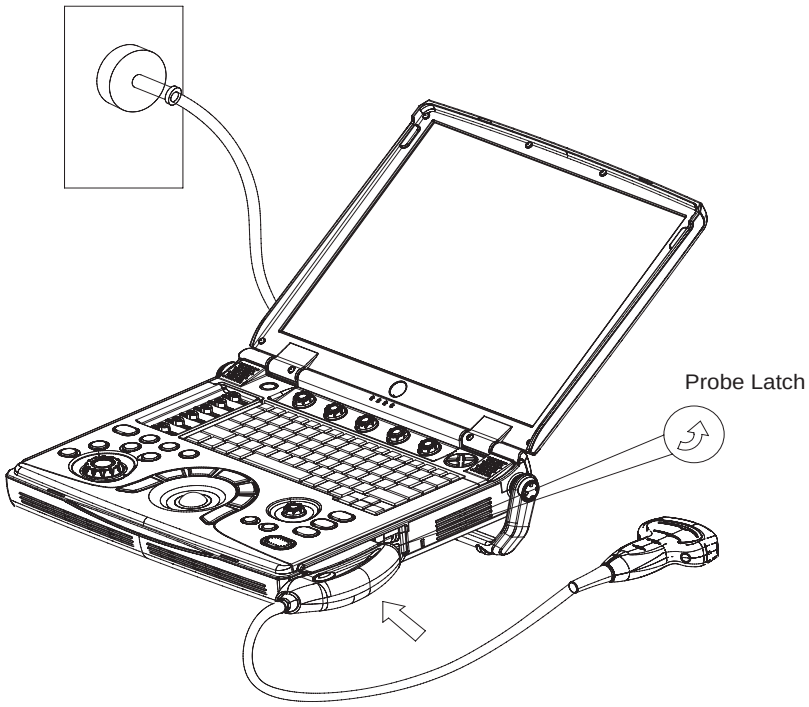



**Figure 3-12 Connect the probe**

*NOTE: It is not necessary to turn OFF power to connect or disconnect a probe.*

# Section 3-6
# System Configuration

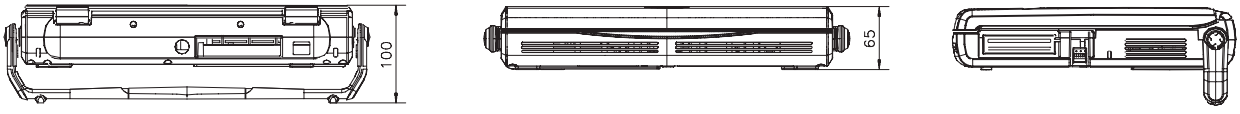
## 3-6-1 System Specifications

### 3-6-1-1 Physical Dimensions

The physical dimensions of the Vivid™ e console are summarized in Figure 3-13 on page 3-11 .

**Table 3-16 Physical Dimensions of Vivid™ e**

| Height | Width | Depth | Unit |
|---|---|---|---|
| 65-100 | 375 | 290-337 | mm |
| 2.56-3.94 | 14.76 | 11.4-13.27 | inches |




**WEIGHT: 4.6KG**
**NOTE: Length is in mm**

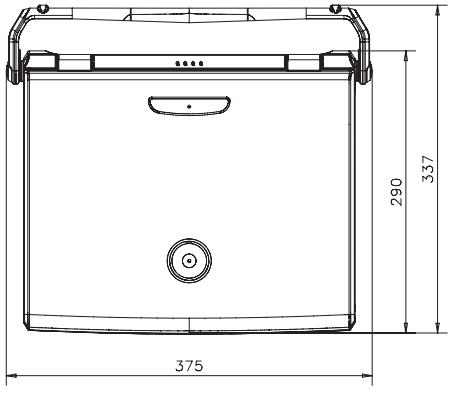



**Figure 3-13 Overall Dimensions**

## 3-6-2 Electrical Specifications

**Table 3-17 Electrical Specifications for Vivid™ e**

| Adapter | Voltage | Tolerances | Current | Frequency |
|---|---|---|---|---|
| TWADP100 | 100-240 VAC | +/-10% | 1.2A (max) | 50/60Hz |

## 3-6-3 Approved on-board peripherals

**Table 3-18 Approved on-board peripherals**

| Device | Manufacturer | Model | Interface |
|---|---|---|---|
| B/W Printer | SONY | UP-D897 | USB |
| Digital Color Printer | SONY | UP-D23MD | USB |
| HP Color Printer | HP | HP Officejet Pro K550 | USB |
| | HP | HP Deskjet 460 | USB |
| DVD-RW | LITEON | LITEON SHM-165P6SX | USB |
| Wireless Lan Adapter | Linksys | Linksys WUSB54G | USB |
| 3-pedal footswitch | Steute | MKF 2-MED GP26 | USB |
| 1-pedal footswitch | Whanam | FSU2001 | USB |
| USB Memory | Kingston | Kingston 512M | USB |
| USB HUB | Shenzhen Gaojian | HE 702A | USB |
| ECG | NORAV | ECG-USB1 | USB |

*NOTE: See each option installation instructions for installation and connection procedures.*

## 3-6-4 Connecting Cables

**WARNING** Equipment damage possibility. Be sure to use the following recommended connecting cables to connect recording devices and a network with Vivid™ e console.

**Table 3-19 List of Connecting Cables**

| Name | Part No. | Figure | NOTE |
|---|---|---|---|
| USB Cable | 5122305 | | For USB Printer & USB DVD-RW |

## 3-6-5 Peripherals/Accessories Connector Panel

Vivid™ e peripherals and accessories can be properly connected using the side connector panel.

### 3-6-5-1 Rear Panel Connector

Located on the rear panel are video input and output connectors, power connector and ethernet port.

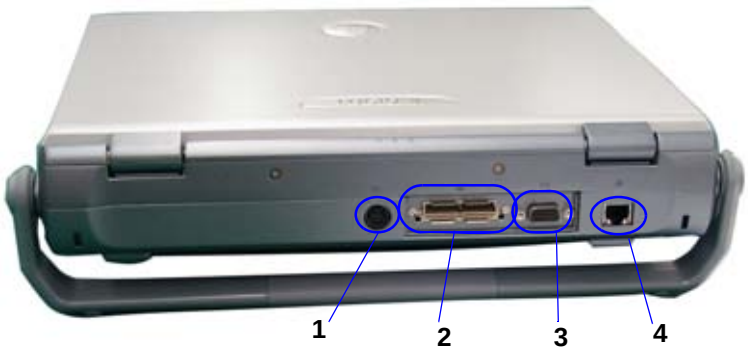



**Figure 3-14 Rear Connector Panel**

1.) Port for DC input (AC Adapter)
2.) Docking Connector
3.) SVGA Output (CRT monitor option is not supported)
4.) Ethernet port

### 3-6-5-2 Left Panel Connector

Located on the left side panel are two USB Ports for control connections for printer, service tools and earphone port.

**Figure 3-15 Left Side Panel**

1.) Two interchangeable USB Port (Digital Printers, DVD-RW and/or Foot Switch, etc.)
2.) Earphone Port.

**NOTICE** The USB devices should be connected to Vivid™ e first, power on USB devices before turning Vivid™ e to work.

*NOTE: Each outer (case) ground line of peripheral/accessory connectors are protectively grounded. Signal ground lines are not isolated.*

**3-6-5-3 This section indicates the pin assignment for each connector.**

1. Pin Assignment of DC input

Connector: 4 Pin, Female

**Table 3-20 Pin Assignments of DC input**

| Pin No. | Signal | Pin No. | Signal |
|---|---|---|---|
| 1 | +20V | 3 | GND |
| 2 | +20V | 4 | GND |

2. Pin Assignment of USB

**Table 3-21 Pin assignment of USB1**

| Pin No. | Signal | Pin No. | Signal |
|---|---|---|---|
| 1 | +5VDC | 3 | DATA+ |
| 2 | DATA- | 4 | GND |

**Table 3-22 Pin assignment of USB2**

| Pin No. | Signal | Pin No. | Signal |
|---|---|---|---|
| 1 | +5VDC | 3 | DATA+ |
| 2 | DATA- | 4 | GND |

3. Pin assignment of RS232C for external VGA

Connector: D-SUB, 15Pin, Female

**Table 3-23 Pin Assignments of RS232C for External VGA**

| Pin No. | Signal | Pin No. | Signal |
|---|---|---|---|
| 1 | RED | 9 | N/A |
| 2 | GREEN | 10 | SGND |
| 3 | BLUE | 11 | N/A |
| 4 | N/A | 12 | N/A |
| 5 | GND | 13 | HSYNC |
| 6 | RGND | 14 | VSYNC |
| 7 | GGND | 15 | N/A |
| 8 | BGND | 16 | |

### 3-6-5-4 Connect peripherals

A.) Connect B/W printer to the system.

B/W Printer can be properly connected using USB Port1 or USB Port 2 (Figure 3-16 on page 3-16 ).

**Figure 3-16 Connect B/W printer to the system**

B.) Connect UP-D23MD color printer to the system.

UP-D23MD Color Printer can be properly connected using USB Port 1 or USB Port 2 (Figure 3-17 on page 3-16 ).

**Figure 3-17 Connect digital color printer to the system**

⚠ **NOTICE** HP Deskjet 460/HP Officejet Pro K550 Color Printer must connect with PIT (Printer Isolation Transformer) when being used.

**3-6-5-4 Connect peripherals** (cont'd)

C.) Connect DVD-RW to the system.

DVD-RW can be properly connected using USB Port1 or USB Port2 (Figure 3-18 on page 3-17 ).

**Figure 3-18 Connect DVD-RW to the system**

**CAUTION DO NOT connect DVD-RW to the system while scanning.**

**LITEON DVD-RW drive recommended media list**

Media issues are common throughout the DVD-RW drive industry. Because DVD media vendors often change disc suppliers, quality levels may change due to manufacturing differences. This means that you may encounter DVD/CD creation problems with media that may have worked successfully before. Overall system configuration and other factors may also affect the success of creating a DVD/CD.

The following media types have been tested. LITEON highly recommends that you use the media types on this list when creating your DVDs/CDs.

Not all brands of media have been tested and, therefore, you may encounter success with other brands not listed. This list will be updated as other media is tested and approved.

**Table 3-24 LITEON DVD-RW drive recommended media list**

| Brand Name | Type |
|---|---|
| SONY | DVD-R |
| SONY | CD-R |
| SONY | DVD-RW |
| Mitsubishi | CD-R |
| Mitsubishi | CD-RW |
| Mitsubishi | DVD-R |
| Mitsubishi | DVD-RW |
| JVC | DVD-R |
| MBI | CD-R |
| MBI | DVD-R |
| Taiyo Yuden | CD-R |
| Taiyo Yuden | DVD-R |

**3-6-5-4 Connect peripherals** (cont'd)

D.) Connect Foot Switch to the system.

Foot Switch can be properly connected using USB Port1 or USB Port2.

**Figure 3-19 Connect Foot Switch to the system**

E.) Connect Wireless LAN Adapter to the system.

Wireless LAN Adapter can be properly connected using the USB cord.

**Figure 3-20 Connect Wireless LAN Adapter to the system**

F.) Connect the CRT to the system.

CRT can be properly connected using the SVGA output.

**3-6-5-4 Connect peripherals** (cont'd)

G.) Connect the USB Memory to the system. The USB Memory can be properly connected using USB port 1 or 2.

**Figure 3-21 USB Memory Connection**

H.) Connect the ECG to the system. ECG can be properly connected using USB port 1 or 2.

**Figure 3-22 ECG**

**3-6-5-4 Connect peripherals** (cont'd)

I.) Connect the Emergency Disk to the system. The Emergency Disk can be properly connected using USB port 1 or 2.

**Figure 3-23 Emergency Disk Connection**

**3-6-5-4 Connect peripherals** (cont'd)

J.) Connect the external monitor to the system. The monitor can be properly connected using the VGA port.

**Figure 3-24 VGA Connection**

Press Ctrl+Alt+V on the keyboard, a dialog box appears.

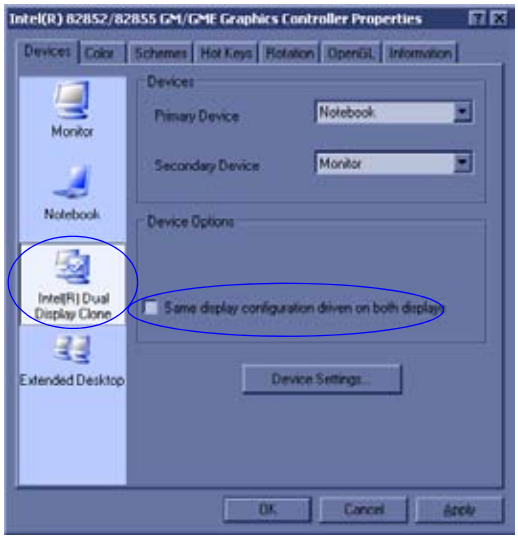



**Figure 3-25 Graphics Controller Properties**

Select Intel(R) Dual Display Clone; check the Same display configuration driver on both display box and select OK.

*NOTE: Please refer to the operation manual of each peripheral for information needed by the user to operate the system safely.*

For detailed installation information, please refer to the Vivid™ e Peripheral Installation Instruction manual.

### 3-6-6 Available Probes

See in specification in the Vivid™ e User Reference Manual for Probes and intended use.

**Table 3-25 List of Probes**

| Probe Name | Material of Headshell | Area of Using | TYPE | Catalog Number | Part Number |
|---|---|---|---|---|---|
| 4C-RS | NORYL | GENERAL PURPOSE | CONVEX | H4000SR | 5131629 |
| i12L-RS | ABS (GE) | INTRAOPERATIVE SMALL PARTS VASCULAR PEDIATRICS | LINEAR | H40402LW | 2377942 |
| 8L-RS | VALOX | SMALL PARTS PERIPHERAL VASCULAR | LINEAR | H40402LT | 2376127 |
| 3S-RS | VALOX | CARDIOLOGY TRANSVAGINAL ABDOMEN | SECTOR | H4000PD | 2355686 |

## Section 3-7 Software/Option Configuration

Refer to the Vivid™ e Basic User Manual, Chapter 16, Customizing Your System for information on configuring items like Hospital, Department, Language, Units (of measure), Date, Time and Date Format.

For information on configuring Software Options, Refer to the Vivid™ e Basic User Manual, Chapter 16, Customizing Your System.

For information on configuring DICOM Connectivity, Refer to the Vivid™ e Basic User Manual, Chapter 16, Customizing Your System.

# Section 3-8
# Connectivity Installation Worksheet

## Site System Information

Site:

Dept:

LOGIQ SN: Type:

Floor:

Room:

REV:

Comments:

CONTACT INFORMATION

| Name | Title | Phone | E-Mail Address |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## TCP/IP Settings

Name - AE Title:

### IP Settings

IP Address:

Subnet Mask:

Default Gateway:

### Remote Archive Setup

Remote Archive IP:

Remote Archive Name:

## Services (Destination Devices)

| | Device Type | Manufacturer | Name | IP Address | Port | AE Title |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
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| 12 | | | | | | |

# Section 3-9
# Loading Base Image Software

*NOTE: While it is believed to be unnecessary, It would not hurt to disconnect the system from the network and remove all transducers.*

*NOTE: Please ensure AC adapter is connected during system upgrade!*

1.) Insert the disk labeled “System & Application Software” into the DVD ROM drive.
2.) Properly turn off the scanner by momentarily pressing the *Power On/Off* Switch. Select “Full Maintenance Reboot” from the System Exit menu.
3.) If the system will not shutdown normally, hold down the *Power On/Off* Switch until the light turns from green to amber.

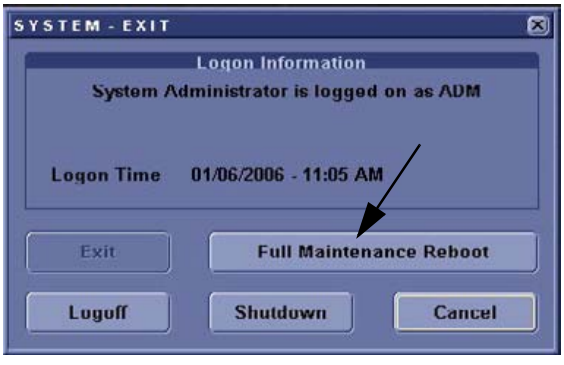


**Figure 3-26 Shutdown Dialog Box**

4.) Turn on the scanner. System will detect the DVD-RW automatically.
5.) Press any key to continue when below message display as shown in Figure 3-27 on page 3-24 .

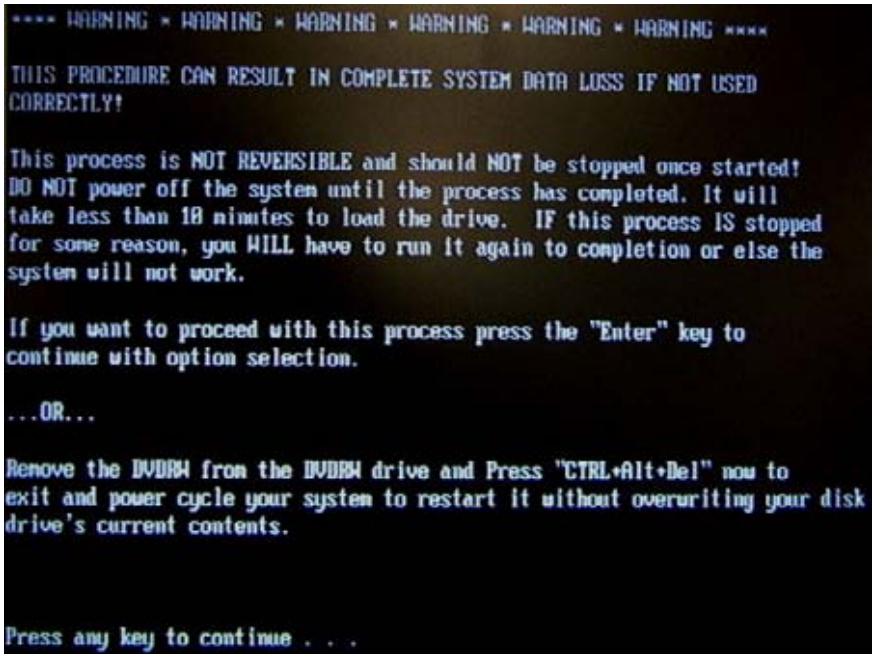
**** WARNING * WARNING * WARNING * WARNING * WARNING * WARNING ****
THIS PROCEDURE CAN RESULT IN COMPLETE SYSTEM DATA LOSS IF NOT USED CORRECTLY!
This process is NOT REVERSIBLE and should NOT be stopped once started! DO NOT power off the system until the process has completed. It will take less than 10 minutes to load the drive. IF this process IS stopped for some reason, you WILL have to run it again to completion or else the system will not work.
If you want to proceed with this process press the "Enter" key to continue with option selection.
...OR...
Remove the DVDRW from the DVDRW drive and Press "CTRL+Alt+Del" now to exit and power cycle your system to restart it without overwriting your disk drive's current contents.
Press any key to continue . . .

**Figure 3-27 Update message**

## Section 3-9 Loading Base Image Software (cont'd)

6.) Select one of the options for loading the system. Select choice [a] to load the complete disk. Refer to Figure 3-28 on page 3-25 .

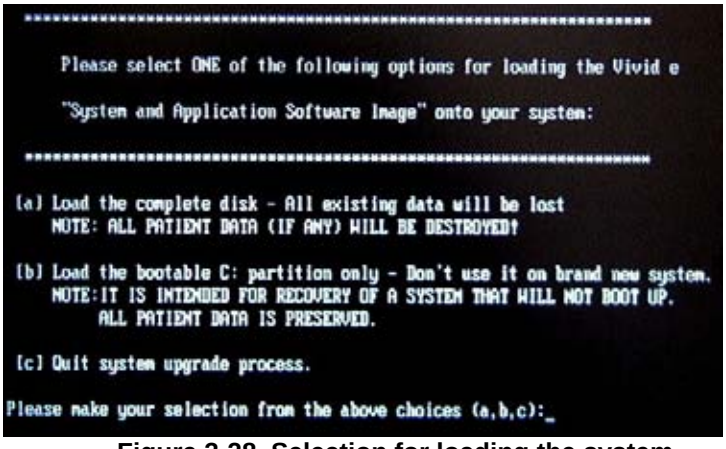
Please select ONE of the following options for loading the Vivid e
"System and Application Software Image" onto your system:
(a) Load the complete disk - All existing data will be lost
NOTE: ALL PATIENT DATA (IF ANY) WILL BE DESTROYED!
(b) Load the bootable C: partition only - Don't use it on brand new system.
NOTE:IT IS INTENDED FOR RECOVERY OF A SYSTEM THAT WILL NOT BOOT UP.
ALL PATIENT DATA IS PRESERVED.
(c) Quit system upgrade process.
Please make your selection from the above choices (a,b,c):_

**Figure 3-28 Selection for loading the system**

⚠ **WARNING** ***While the software install procedure is designed to preserve data, you should select choice [b] to format disk C only.***

7.) Press "Yes" or "No" to continue.

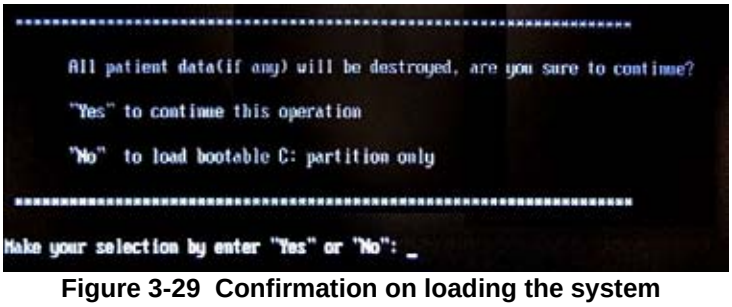
All patient data(if any) will be destroyed, are you sure to continue?
"Yes" to continue this operation
"No" to load bootable C: partition only
Make your selection by enter "Yes" or "No": _

**Figure 3-29 Confirmation on loading the system**

8.) System CD will be loaded as shown in Figure 3-30 on page 3-25 .

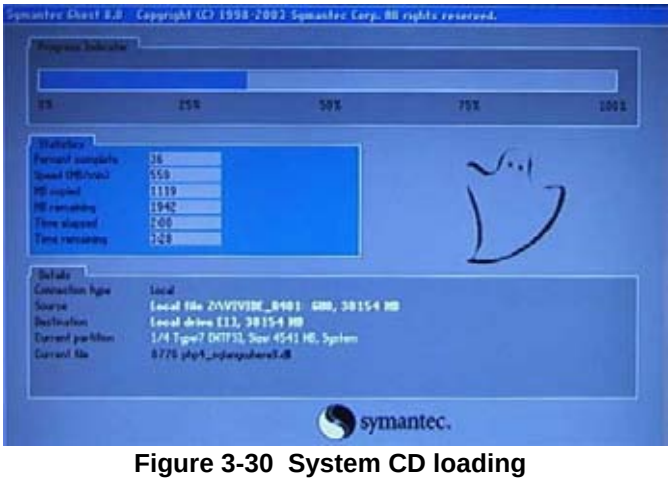


**Figure 3-30 System CD loading**

## Section 3-9 Loading Base Image Software (cont'd)

9.) After finish updating system, refer to Figure 3-31 on page 3-26 .

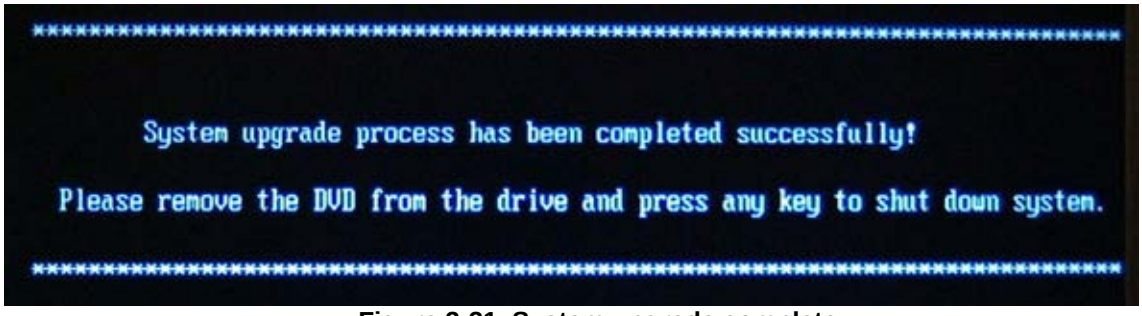
System upgrade process has been completed successfully!
Please remove the DVD from the drive and press any key to shut down systen.

**Figure 3-31 System upgrade complete**

10.) Press any key to reboot system. When system first time boot up after upgrading complete, you will see the following message.

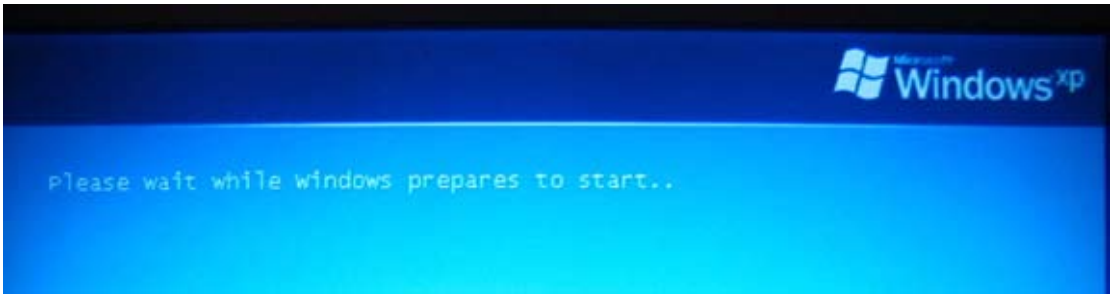


**Figure 3-32 Windows start**

11.) Make a region selection when below message display as show in Figure 3-33 on page 3-26 .

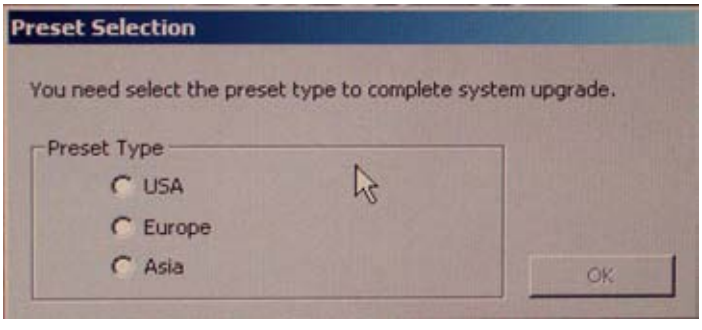


**Figure 3-33 Region selection message**

# Section 3-10Software Version check out

## 3-10-1 Functional Check-out

1.) Power on Vivid™ e scanner and wait until system booting to main screen.
2.) Press UTILITY key on control panel.
3.) Choose the About button on the right.

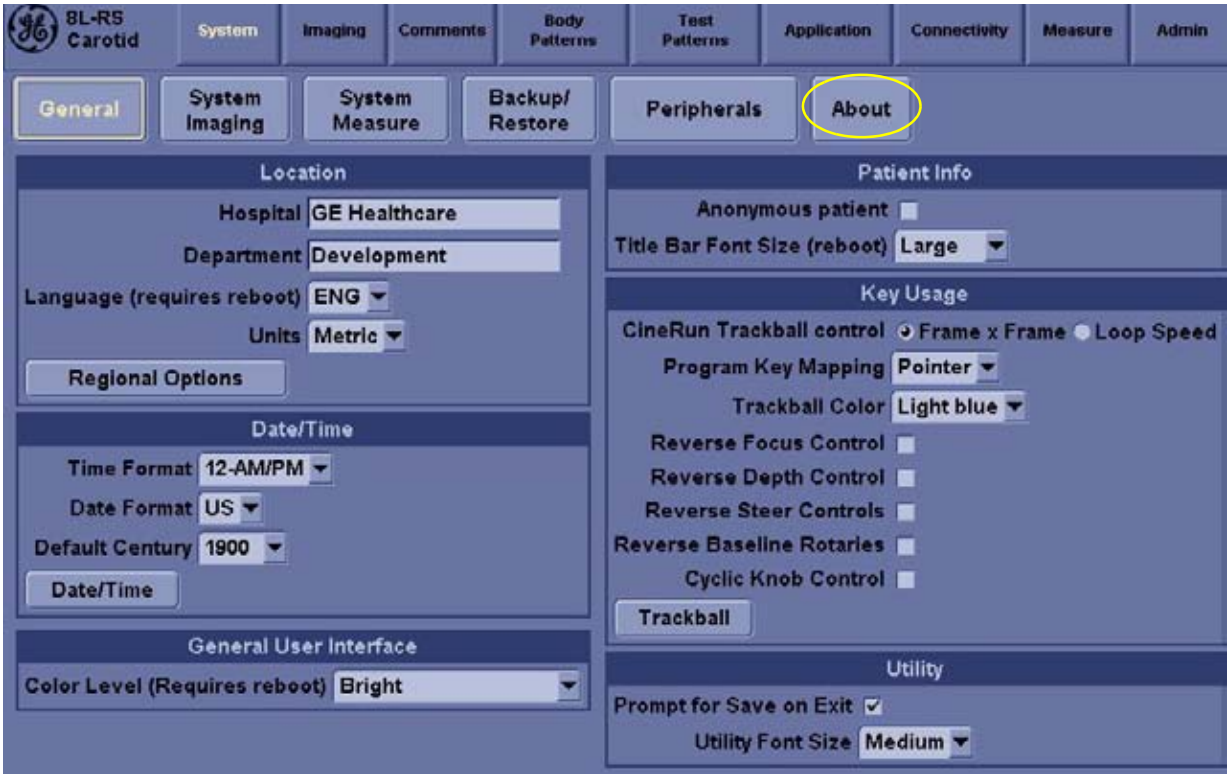


**Figure 3-34 About**

4.) Check whether "Software version" is the right version for use.

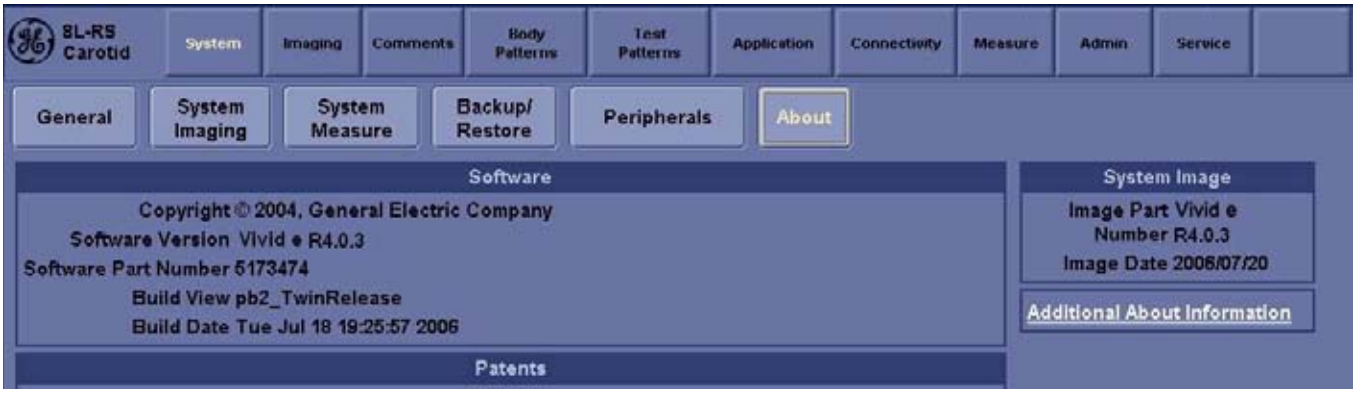


**Figure 3-35 Software version**

# Section 3-11
# Paperwork

*NOTE: During and after installation, the documentation (i.e. User Manuals, Installation Manuals...) for the peripheral units must be kept as part of the original system documentation. This will ensure that all relevant safety and user information is available during the operation and service of the complete system.*

## 3-11-1 Product Locator Installation

*NOTE: The Product Locator Installation Card shown may not be same as the provided Product Locator card.*

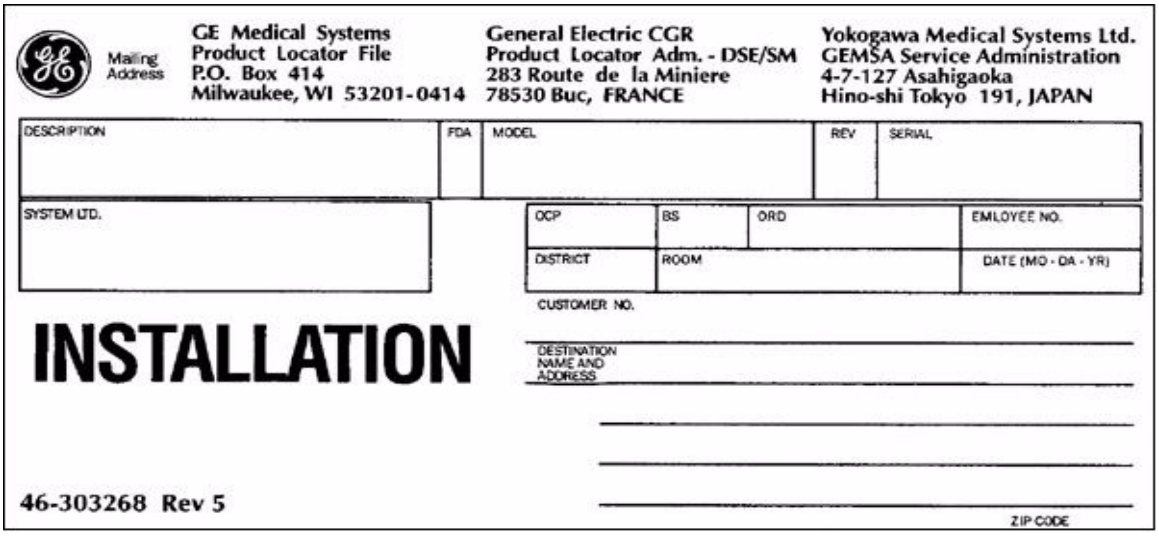


**Figure 3-36 Product Locator Installation Card**

## 3-11-2 User Manual(s)

User Check that the correct User Manual(s) for the system and software revision, is included with the installation. Specific language versions of the User Manual may also be available. Check with your GE Sales Representative for availability.

# Chapter 4
# Functional Checks

## Section 4-1
## Overview

### 4-1-1 Purpose for Chapter 4

This chapter provides procedures for quickly checking major functions of the Vivid™ e console, diagnostics by using the built-in service software, and power supply adjustments.

**Table 4-26 Contents in chapter 4**


| Section | Description | Page Number |
|---|---|---|
| 4-1 | Overview | 4-1 |
| 4-2 | Required Equipment | 4-1 |
| 4-3 | General Procedure | 4-2 |
| 4-4 | Software Configuration Checks | 4-36 |
| 4-5 | Peripheral Checks | 4-36 |


## Section 4-2
## Required Equipment

To perform these tests, you'll need any of the sector, linear, or convex transducers.

(normally you should check all the transducers used on the system)

# Section 4-3
# General Procedure

**CAUTION** **SYSTEM REQUIRES ALL COVERS**
**Operate this unit only when all board covers and frame panels are securely in place. The covers are required for safe operation, good system performance and cooling purposes.**

**NOTICE** Lockout/Tagout Requirements (For USA only)

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the Power Cable on the system.

## 4-3-1 Power On/Boot Up

After AC/DC is connected correctly to the scanner, the power is applied to the scanner. When the Control panel ***Power On/Off*** key is pressed once, the System starts.

### 4-3-1-1 Scanner Power On

Lower the handle. Plug the AC adapter output connector into the system DC input port (located on the system's rear panel) with the arrow side upward. Plug the AC adapter power cord into a grounded, protective earth outlet.

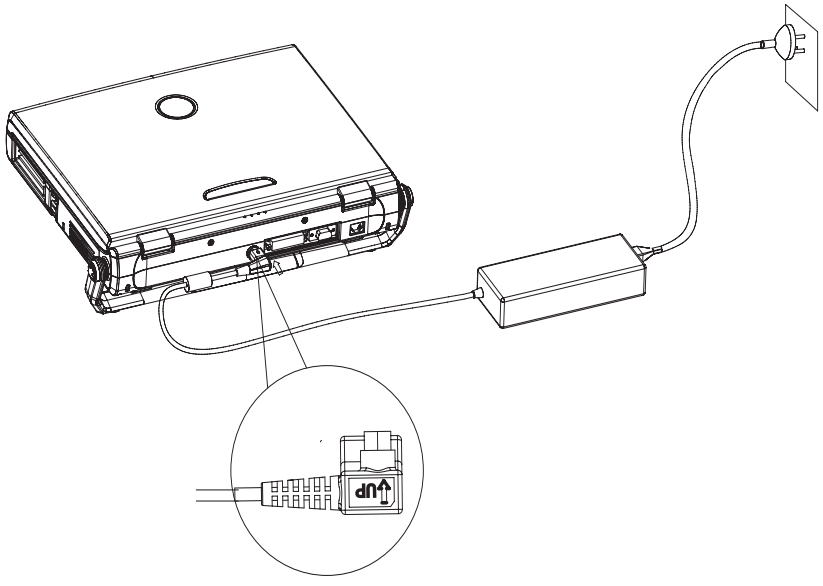


**Figure 4-37 connect AC adapter**

**4-3-1-1 Scanner Power On** (cont'd)

When power is applied to the scanner, power is distributed to the Cooling Unit, Control Panel, LCD, Peripherals and the Back-end Processor.

**4-3-1-2 Turn on the system**

Press the ***Power On/Off*** switch at the front of the system once.

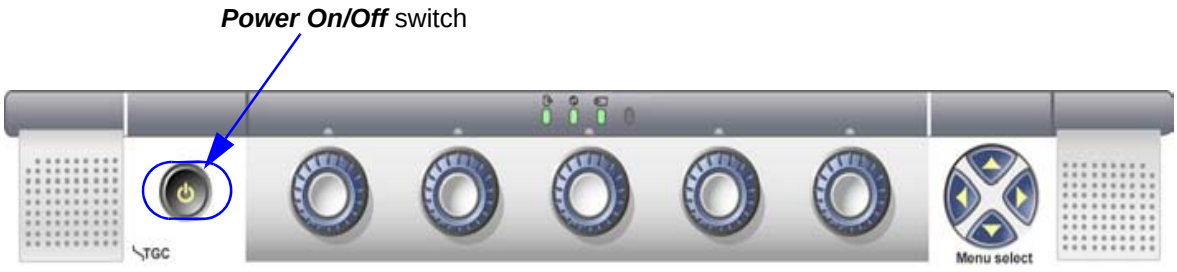


**Figure 4-38 Power On/Off Switch**

When the ***Power On/Off*** switch on the Control Panel is pressed once, the Back-end Processor starts and the software code is distributed to initiate the scanner.

No status messages are displayed during this process.

## 4-3-2 Power Off/ Shutdown

*NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.*

**4-3-2-1 Back-end Processor Power Down**

To power down the system:

1.) Press the ***Power On/Off*** switch at the front of the system once.
2.) The System-Exit window is displayed.

**Figure 4-39 System Exit Window**

3.) Using the Trackball or Select key, select Shutdown.

**4-3-2-1 Back-end Processor Power Down** (cont'd)

4.) The shutdown process takes 15 seconds and the power off sequence is complete when the power status LED is turned off.

5.) Disconnect the probes.Clean or disinfect all probes as necessary. Store them in their shipping cases to avoid damage.

6.) Close LCD cover.

**4-3-2-2 Scanner Shutdown**

Disconnect the Mains Power Cable is necessary. *For example:* Relocating the scanner.

⚠ **CAUTION** **DO NOT unplug and/or transport the unit until after the power off sequence has been completed. Failure to do so may result in corrupted patient files.**

**4-3-2-3 Full Maintenance Reboot**

Full Maintenance Reboot will fully restart the whole system for performance improvement.

1.) Press the ***Power On/Off*** switch at the front of the system once.

2.) Click "Full Maintenance Reboot".

3.) Full Maintenance Reboot dialog is displayed.

Information - Full Maintenance Reboot
System will be automatically restarted for maintenance after shut down, it will take about 2 minutes.
Ok

**Figure 4-40 "Full Maintenance Reboot" dialog**

## 4-3-3 Archiving and Loading Presets

*NOTE: Always save presets before any software reload. This ensures the presets loaded after the software reload are as up–to–date as possible.*

All user presets except changes to Summary, Anatomy, and Biometry pages, can be saved on an DVD-R disk (or USB memory device) for reloading on the system.

⚠ **NOTICE** Presets should NOT be saved on the same DVD-R disk (or USB memory device) as images. The Archive Menu lists the images but does NOT list the presets stored on a DVD-R disk (or USB memory device).

### 4-3-3-1 Archiving Presets to an DVD-R Disk (or USB memory device)

1.) Insert an empty (blank) DVD-R disk into the DVD-RW.

2.) Access to the Utility Menu, and select System. The Backup sheet will be shown on the LCD display.

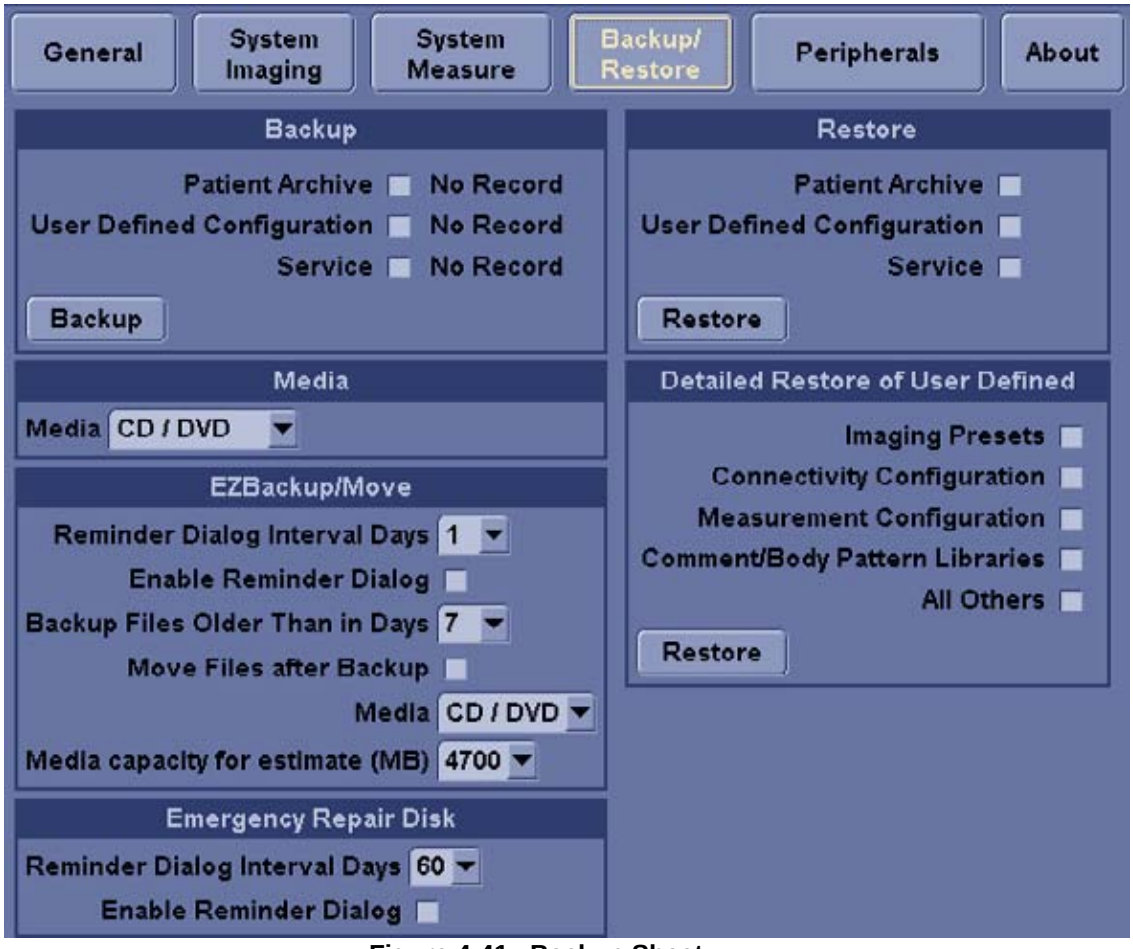


**Figure 4-41 Backup Sheet**

3.) Select the item to back up either from Resource Files.

4.) Enter backup destination or browse through the disk to locate the destination.

5.) Select Backup now. The backup status for each item is displayed on the Result column.

#### 4-3-3-2 Loading Presets from an DVD-R disk (or USB memory device)

1.) Insert the DVD-R disk with the archived Presets into the DVD-RW.
2.) Access to the Utility Menu, and select System. The Restore sheet will be shown on the LCD display. (see Figure 4-41 on page 4-5 )
3.) Select the item to restore either from Resource Files.
4.) Enter restore destination or browse through the disk to locate the destination.
5.) Select Restore. The restore status for each item is displayed on the Result column.

### 4-3-4 Adjusting the Display Monitor

Please refer to Section 6-2 "Monitor Adjustments" on page 6-2.

### 4-3-5 Lockout/Tagout Requirements (For USA Only)

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the AC plug.

## 4-3-6 System Features

### 4-3-6-1 Control Panel

**Figure 4-42 Control Panel Tour**

1.) TGC
2.) New Patient
3.) End Exam
4.) Mode/Gain/Auto Keys
5.) Preset Key
6.) Imaging/Measurement Keys
7.) Depth/Zoom/Ellipse
8.) Image Keys
9.) Print Keys
10.) Freeze
11.) Keyboard

### 4-3-6-2 Vivid™ e SoftMenu Key Tour

In general, there are two types of softMenu keys: Paddle Switch and adjustable knobs.

**Figure 4-43 SoftMenu Key Tour**

1.) The Paddle Switch is used to access and adjust the Sub SoftMenu.
2.) Press the adjustable knobs to toggle option menu between line one and line two.
3.) Rotate the adjustable knobs to adjust the corresponding parameters.

### 4-3-6-3 Monitor Display

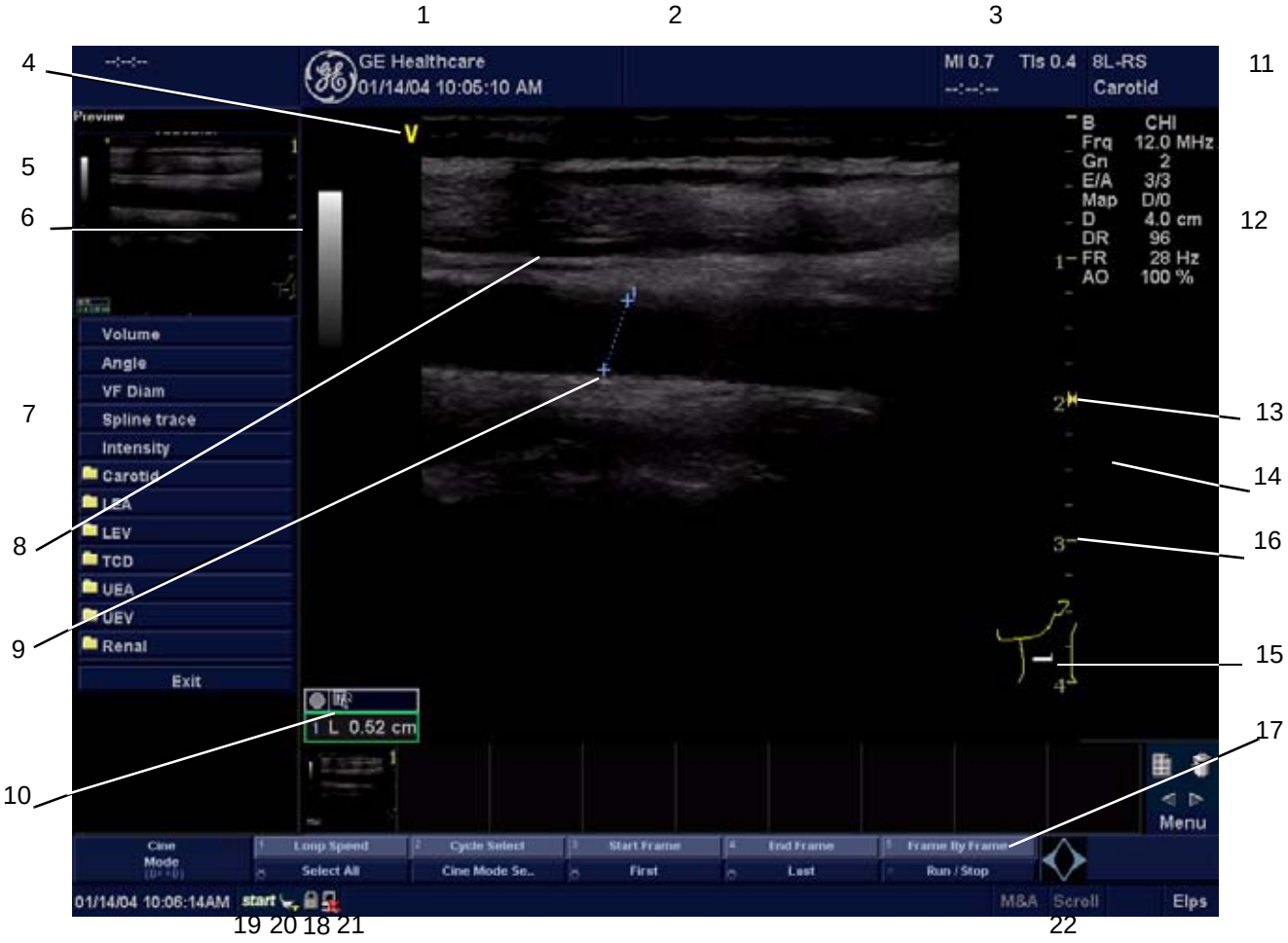


**Figure 4-44 Monitor Display Tour**

**Table 4-27 Monitor Display Features**

| | |
|---|---|
| 1. Institution/Hospital Name, Date, Time, Operator Identification, system status (real-time of frozen). | 12. Imaging Parameters by Mode (current mode highlighted). |
| 2. Patient Name, Patient Identification. | 13. Focal Zone. |
| 3. Acoustic Output Readout, | 14. TGC (not shown on the image). |
| 4. GE Symbol: Probe Orientation Marker. Coincides with a probe orientation marking on the probe. | 15. Body Pattern. |
| 5. Image Preview. | 16. Depth Scale. |
| 6. Gray/Color Bar. | 17. SoftMenu |
| 7. Measurement Summary Window. | 18. Caps Lock: On/Off. |
| 8. Image. | 19. Start menu icon. |
| 9. Measurement. | 20. Battery icon. |
| 10. Results Window. | 21. Network icon. |
| 11. Probe Identifier. Exam Study. | 22. Trackball Functionality Status: Scroll, M&A (Measurement and Analysis), Position, Size, Scan Area Width and Tilt. |

## 4-3-7 B Mode Checks

### 4-3-7-1 Preparations

1.) Connect one of the probes listed in 3-6-6 "Available Probes" on page 3-22, in Chapter 3 Installation to the System probe connector.

2.) Turn ON the scanner (if it isn't turned on already))

**Figure 4-45 Controls available in B Mode**

**Figure 4-46 B Mode Screen Picture Example**

### 4-3-7-2 B Mode OP Panel Controls (future validate)

**Table 4-28 B Mode Control Panel Controls**

| Step | Task | Expected Result(s) |
|---|---|---|
| 1 | Press B Mode key | B Mode Starts |
| 2 | Adjust Depth | Adjust the field of view. Increasing the depth may view larger/deeper structures rates, and decreasing the depth may view near the skin line.Press Up/Down Button to increase/ decrease. Depth displays on the monitor in cm. |
| 3 | Adjust Gain | Controls the amount of echo information displayed in an image. Turn B Mode dial to the left/right to increase/decrease Gain. Gain displays on the monitor in G (dB). |
| 4 | Adjust Focus | Increases the number of focal zones or moves the focal zone(s) to tighten up the beam for specific area. Press the control to toggle between Focus Position and Focus Number. Press Up/Down Button to move or adjust the focal numbers. |
| 5 | Activate Auto Optimize | Optimize the image based upon a specified region of interest or anatomy. Press the Center Button in the Gain Dial to toggle the ATO/ACE On and Off. |
| 7 | Adjust Time Gain Compensation (TGC) | Amplifies the returning signals to correct for the attenuation caused by tissues at increasing depth. TGC slide pots spaced proportional to the depth. Move the slide pots to the left/right to decrease/increase TGC. A TGC curve appears on the display. |
| 8 | Adjust Scan Area | Widen or narrow the size of the sector angle to maximize the image's region of interest (ROI). Press Scan Area and move the Trackball to narrow/widen the angle. |
| 9 | Adjust Zoom | Changes the location of the focal point(s). A triangular focus marker indicates the depth of the focal point. |
| 10 | Zoom Clear | Clear Zoom to normal condition. |
| 11 | Reverse | Toggles the left/right orientation of the scan image. |

### 4-3-7-3 B Mode Softmenu Key

**Table 4-29 B Mode Softmenu Key**

| Step | Task | Expected Result(s) |
|---|---|---|
| 1 | Adjust Rejection | Selects a level below which echoes will not be amplified (an echo must have a certain minimum amplitude before it will be processed). |
| 2 | Activate Colorize | Enables gray scale image colorization. To deactivate, reselect a Gray Map. |
| 3 | Adjust Edge Enhance | Edge Enhance brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. Adjustments to M Mode's edge enhancement affects the M Mode only. |
| 4 | Activate Gray Map | Determines how the echo intensity levels received are presented as shades of gray. |
| 5 | Adjust Frequency | Multi Frequency mode lets you downshift to the probe's next lower frequency or shift up to a higher frequency. |
| 6 | Adjust Frame Average | Temporal filter that averages frames together. This has the effect of presenting a smoother, softer image. |
| 7 | Adjust Rotation | Rotates the image by selecting the value from the pop-up menu. |
| 9 | Adjust Line Density | Optimizes B Mode frame rate or spatial resolution for the best possible image. |
| 10 | Power output | Optimizes image quality and allows user to reduce beam intensity. 2% increments between 0-100%. Values greater than 0.1 are displayed. |
| 11 | Dynamic Range | Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast. |
| 12 | Focus Number and Position | Increases the number of transmit focal zones or moves the focal zone(s) so that you can tighten up the beam for a specific area. A graphic caret corresponding to the focal zone position(s) appears on the right edge of the image. |
| 13 | Virtual Convex | Virtual Convex for linear probe |

## 4-3-8 M Mode Controls

### 4-3-8-1 Preparations

1.) Connect one of the probes listed in 3-6-6 "Available Probes" on page 3-22, in Chapter 3 Installation to the System probe connector.

2.) Turn ON the scanner (if it isn't turned on already).

**Figure 4-47 Controls available in M Mode**

**Figure 4-48 M Mode Screen Picture Example**

### 4-3-8-2 M Mode OP Panel Controls

**Table 4-30 M Mode OP Panel Controls**

| Step | Task | Expected Result(s) |
|---|---|---|
| 1 | Press M Mode key | M Mode Starts |
| 2 | Adjust Gain | Controls the amount of echo information displayed in an image. Turn B Mode dial to the left/right to increase/decrease Gain. Gain displays on the monitor in G (dB). |
| 3 | Display M-Mode Cursor | Displays the M-Mode cursor on the B-Mode image. Press Cursor and Trackball to position M-Mode Cursor. |

### 4-3-8-3 M Mode Softmenu Key

**Table 4-31 M Mode Softmenu Key**

| Step | Task | Expected Result(s) |
|---|---|---|
| 1 | Adjust Rejection | Selects a level below which echoes will not be amplified (an echo must have a certain minimum amplitude before it will be processed). |
| 2 | Adjust Sweep Speed | Changes the speed at which the time line is swept. The following speed values are available, 1, 2, 3, 4, 6, 8, 12, 16. |
| 3 | Adjust Edge Enhance | Edge Enhance brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. Adjustments to M Mode's edge enhancement affects the M Mode only. |
| 4 | Activate Gray Map | Determines how the echo intensity levels received are presented as shades of gray. |
| 6 | Activate Colorize | Enables gray scale image colorization. To deactivate, reselect a Gray Map. |
| 7 | Activate Full Timeline | Displays only timeline screen. Press the Full Timescreen to activate. |
| 8 | Select Display Format | Select the format to display B image and M image on the LCD. Press Display Format, and select from the pop up menu. |
| 9 | Adjust Dynamic Range | Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast. |
| 10 | Power output | Optimizes image quality and allows user to reduce beam intensity. 2% increments between 0-100%. Values greater than 0.1 are displayed. |

## 4-3-9 Color Flow Mode Checks

### 4-3-9-1 Preparations

1.) Connect one of the probes listed in 3-6-6 "Available Probes" on page 3-22, in Chapter 3 Installation to the System probe connector.

2.) Turn ON the scanner (if it isn't turned on already).

**Figure 4-49 Controls available in Color Flow Mode**

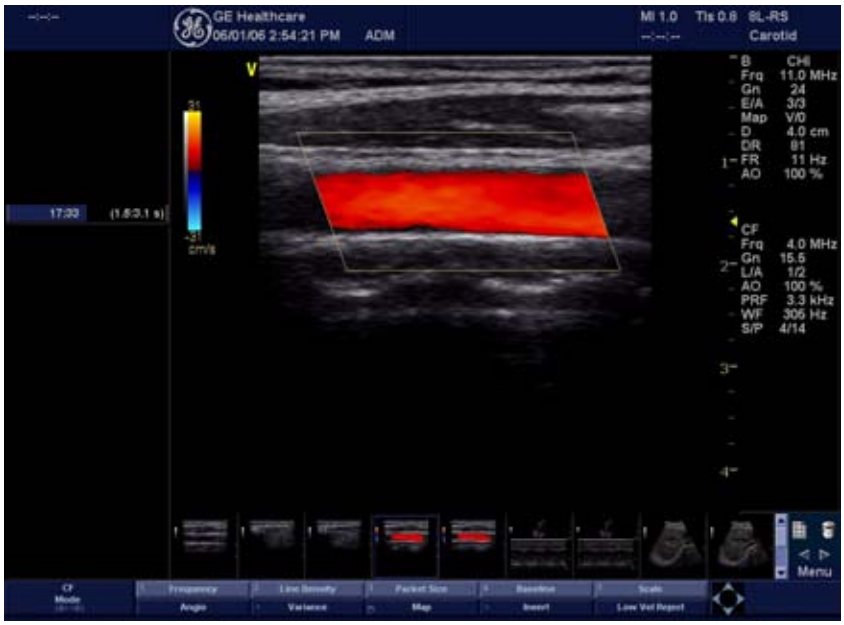


**Figure 4-50 CFM Mode Screen Picture Example**

### 4-3-9-2 Color Flow Mode OP Panel Controls

**Table 4-32 Color Flow Mode OP Panel Controls**

| Step | Task | Expected Result(s) |
|---|---|---|
| 1 | Press CFM-Mode key | CFM Mode Starts |
| 2 | Adjust Gain | Amplifies the overall strength of the echoes processed in the Color Flow window. Turn the Gain dial (CFM Mode key) to the left/right to increase/decrease Gain. |

### 4-3-9-3 Color Flow Mode Softmenu Key

**Table 4-33 Color Flow Mode Softmenu Key**

| Step | Task | Expected Result(s) |
|---|---|---|
| 1 | Threshold | Threshold assigns the gray scale level at which color information stops. |
| 2 | Packet Size | Controls the number of samples gathered for a single color flow vector. |
| 3 | Select Color maps | Allows a specific color map to be selected. After a selection has been made, the color bar displays the resultant map. |
| 4 | Adjust Frequency | Enables the adjustment of the probe's operating frequency. Press Frequency and select desired value. The selected frequency is displayed in the status window. |
| 5 | Set Frame Average | Averages color frames. Press Frame Average up/down to smooth temporal averaging. |
| 6 | Color Invert | Views blood flow from a different perspective. Press Invert to reverse the color map. |
| 7 | Adjust LIne Density | Trades frame rate for sensitivity and spatial resolution. If the frame rate is too slow, reduce the size of the region of interest, select a different line density setting, or reduce the packet size. |
| 8 | Activate Spatial Filter | |
| 9 | Adjust Dynamic Range | Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast. |
| 10 | Activate ACE | Eliminates the motion artifacts. Press Ace to activate. |
| 11 | Adjust Angle Steer | Slants the Color Flow region of interest or the Doppler line to obtain a better Doppler angle. |
| 12 | Move Baseline | Adjusts the baseline to accommodate faster or slower blood flows to eliminate aliasing. |
| 13 | Change Scale<br>(Pulse Repetition Frequency) | Velocity scale determines pulse repetition frequency. If the sample volume gate range exceeds single gate PRF capability, the system automatically switches to high PRF mode. Multiple gates appear, and HPRF is indicated on the display. |
| 14 | Transparency Map | |
| 15 | Focus Position | Increases the number of transmit focal zones or moves the focal zone(s) so that you can tighten up the beam for a specific area. A graphic caret corresponding to the focal zone position(s) appears on the right edge of the image. |
| 16 | Capture | |

**Table 4-33 Color Flow Mode Softmenu Key**

| Step | Task | Expected Result(s) |
|---|---|---|
| 17 | Power output | Optimizes image quality and allows user to reduce beam intensity. 10% increments between 0-100%. Values greater than 0.1 are displayed. |
| 18 | Low Vel Reject | Low Vel Reject insulates the Doppler signal from excessive noise caused from vessel movement. |
| 19 | Angio | To enter PDI (Power Doppler Imaging) mode while not in CARD application. For CARD application, there's no "Angio" rotary on primary menu. |

## 4-3-10 Doppler Mode Checks

### 4-3-10-1 Preparations

1.) Connect one of the probes listed in 3-6-6 "Available Probes" on page 3-22, in Chapter 3 Installation to the System probe connector.

2.) Turn ON the scanner (if it isn't turned on already).

**Figure 4-51 Controls available in Doppler Mode**

**Figure 4-52 Doppler Mode Screen Picture Example**

### 4-3-10-2 Doppler Mode OP Panel Controls

**Table 4-34 Doppler Mode OP Panel Controls**

| Step | Task | Expected Result(s) |
|---|---|---|
| 1 | Press PW Mode key | PW Mode Starts |
| 2 | Adjust Gain | Amplifies the overall strength of the echoes processed in the Color Flow window. Turn the Gain dial (PW Mode key) to the left/right to increase/decrease Gain. |
| 3 | Display M/D-Mode Cursor | Displays the M/D-Mode cursor on the B-Mode image. Press Cursor and Trackball to position sample volume graphic. Click SV gate to adjust sample volume gate size. |
| 4 | B-Pause | Toggle between simultaneous and update presentation while viewing Spectral Doppler. Press B Pause to toggle between simultaneous and update. |

### 4-3-10-3 Doppler Mode OP Panel Controls

**Table 4-35 Doppler Mode Touch Panel Controls**

| Step | Task | Expected Result(s) |
|---|---|---|
| 1 | Adjust Rejection | Selects a level below which echoes will not be amplified (an echo must have a certain minimum amplitude before it will be processed). |
| 2 | Adjust Sweep Speed | Changes the speed at which timeline is swept. Press Sweep Speed up/down to increase/decrease the value. |
| 3 | Activate Full Timeline | Displays only timeline screen. Press the Full Timescreen to activate. |
| 4 | Select Display Format | Display layout can be preset to have B-Mode and Time-motion side-by-side or over-under. |
| 5 | Adjust Frequency | Enables the adjustment of the probe's operating frequency. Press Frequency and select desired value. The selected frequency is displayed in the status window. |
| 6 | Trace Direction | |
| 7 | Invert | Vertically inverts the spectral trace without affecting the baseline position. Press invert to invert the spectral trace. The Plus and Minus signs on the velocity scale reverse when the spectrum is inverted. |
| 9 | Modify Calcs | |
| 10 | Trace Method | |
| 11 | Activate Colorize | Colorize the gray scale image to enhance the eyes' discrimination capability. Press the Cololize, Trackball to cycle through available maps and press Set to select. |
| 12 | Activate Gray Map | Displays a map window adjacent to the image. Move the trackball to select the map. The image reflects the map as scrolled through the selections. Press Set to select. |
| 13 | Dynamic Range | Controls how echo intensities are converted to shades of gray. Click Dynamic Range to increase/decrease the value. |
| 14 | Adjust Angle Correct | Estimates the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and the flow to be measured. |
| 15 | Adjust Angle Steer | Slant the Color Flow linear image left or right to get more information without moving probes. Click Angle Steer to the left to slant the linear image. |
| 16 | Move Baseline | Adjusts the baseline to accommodate faster or slower blood flows to eliminate aliasing. |

**Table 4-35 Doppler Mode Touch Panel Controls**

| Step | Task | Expected Result(s) |
|---|---|---|
| 17 | Change Scale - (Low Vel Reject) | Velocity scale determines pulse repetition frequency. If the sample volume gate range exceeds single gate PRF capability, the system automatically switches to high PRF mode. Multiple gates appear, and HPRF is indicated on the display. |
| 18 | Trace Sensitivity | |
| 19 | Time Resolution | |
| 20 | Spectral Average | |
| 21 | Power output | Optimizes image quality and allows user to reduce beam intensity. 10% increments between 0-100%. Values greater than 0.1 are displayed. |
| 22 | SV Length | Sizes the sample volume gate. |
| 23 | Low Vel Reject | Wall Filter insulates the Doppler signal from excessive noise caused from vessel movement. |

## 4-3-11 Basic Measurements

*NOTE: The following instructions assume that you first scan the patient and then press **Freeze**.*

### 4-3-11-1 Distance and Tissue Depth Measurements

1.) Press **MEASURE** once; an active caliper displays.
2.) To position the active caliper at the start point (distance) or the most anterior point (tissue depth), move the **TRACKBALL**.
3.) To fix the start point, press ***Set***. The system fixes the first caliper and displays a second active caliper.
4.) To position the second active caliper at the end point (distance) or the most posterior point (tissue depth), move the **TRACKBALL**.
5.) To complete the measurement, press **SET**. The system displays the distance or tissue depth value in the measurement results window.

Before you complete a measurement:

To toggle between active calipers, press **MEASURE**.

To erase the second caliper and the current data measured and start the measurement again, press **CLEAR** once.

*NOTE: To rotate through and activate previously fixed calipers, adjust **CURSOR SELECT**.*

*NOTE: After you complete the measurement, to erase all data that has been measured to this point, but not data entered onto worksheets, press **CLEAR**.*

### 4-3-11-2 Circumference/Area (Ellipse) Measurement

1.) Press **MEASURE** once; an active caliper displays.
2.) To position the active caliper, move the **TRACKBALL**.
3.) To fix the start point, press **SET**. The system fixes the first caliper and displays a second active caliper.
4.) To position the second caliper, move the **TRACKBALL**.
5.) Adjust the **ELLIPSE**; an ellipse with an initial circle shape appears.
6.) To position the ellipse and to size the measured axes (move the calipers), move the **TRACKBALL**.
7.) To increase the size, rotate the **ELLIPSE** button clockwise. To decrease the size, contrarotate the **ELLIPSE** button.
8.) To toggle between active calipers, press **MEASURE**.
9.) To complete the measurement, press **SET**. The system displays the circumference and area in the measurement results window.

Before you complete a measurement:

- To erase the ellipse and the current data measured, press **CLEAR** once. The original caliper is displayed to restart the measurement.
- To exit the measurement function without completing the measurement, press **CLEAR** a second time.

### 4-3-11-3 Worksheets

Measurement/Calculation worksheets are available to display and edit measurements and calculations. There are generic worksheets as well as Application specific worksheets. The worksheets are selected from the Measurement Touch Panel.

## 4-3-12 Probe/Connectors Usage

### 4-3-12-1 Connecting a probe

1.) Place the probe's carrying case on a stable surface and open the case.
2.) Carefully remove the probe and unwrap the probe cable.
3.) DO NOT allow the probe head to hang free. Impact to the probe head could result in irreparable damage.
4.) Align the connector with the probe port and carefully push into place.
5.) Lock the probe latch upward.
6.) Carefully position the probe cord so it is free to move and is not resting on the floor.

### 4-3-12-2 Activating the probe

The probe activates in the currently-selected operating mode. The probe's default settings for the mode and selected exam are used automatically.

### 4-3-12-3 Deactivating the probe

When deactivating the probe, the probe is automatically placed in standby mode.

1.) Press the ***Freeze*** key.
2.) Gently wipe the excess gel from the face of the probe. (Refer to the Basic User Manual for complete probe cleaning instructions.)
3.) Carefully slide the probe around the right side of the keyboard, toward the probe holder. Ensure that the probe is placed gently in the probe holder.

### 4-3-12-4 Disconnecting the probe

Probes can be disconnected at any time. However, the probe should not be selected as the active probe.

1.) Unlock the probe latch downward.
2.) Pull the probe and connector straight out of the probe port.
3.) Carefully slide the probe and connector away from the probe port and around the right side of the keyboard.
4.) Ensure the cable is free.
5.) Be sure that the probe head is clean before placing the probe in its storage box.

**WARNING** ***Take the following precautions with the probe cables: Do not bend. If you have purchased the cart option, be sure to keep probe cables free from the wheels.***

**WARNING** ***Be careful not to trip on the probe cables if using the device without the optional cart.***

## 4-3-13 Using Cine

### 4-3-13-1 Activating CINE

Press **Freeze**, then roll the **Trackball** to activate CINE. To start CINE Loop playback, press Run/Stop. To stop CINE Loop playback. press Run/Stop.

### 4-3-13-2 Quickly Move to Start/End Frame

Press ***First*** to move to the first CINE frame; press ***Last*** to move to the last CINE frame.

#### 4-3-13-3 Start Frame/End Frame

Press the ***Start Frame*** Two-Button Softkey to move to the beginning of the CINE Loop. Adjust the ***Start Frame*** up/down Two-Button Softkey upward to move forward through the CINE Loop. Adjust the Softkey downward to move backward through the CINE Loop.

Press the ***End Frame*** Two-Button Softkey to move to the end of the CINE Loop. Adjust the ***End Frame*** up/down Two-Button Softkey upward to move forward through the CINE Loop. Adjust the Softkey downward to move backward through the CINE Loop.

#### 4-3-13-4 Adjusting the CINE Loop Playback Speed

Adjust the ***Loop Speed*** up/down Two-Button Softkey to increase/decrease the CINE Loop playback speed.

#### 4-3-13-5 Moving through a CINE Loop Frame By Frame

Adjust the ***Frame by Frame*** up/down Two-Button Softkey to move through CINE memory one frame at a time.

## 4-3-14 Image Management (QG)

For Image Management functionality refer to the Vivid™ e Quick Guide. It talks about several topics:

- Clipboard
- Printing Images
- Browsing and Managing an Exam’s Stored Image
- Connectivity, and Dataflow Concept and Creation
- Starting an Exam
- Configuring Connectivity
- TCP/IP
- Services (Destinations)
- Buttons
- Views
- Verifying and Pinging a Device

## 4-3-15 Backup and Restore Database, Preset Configurations and Images

### 4-3-15-1 Formatting Media

1.) To format the backup media, DVD-RW, select the **UTILITY** button on the Keyboard.

2.) Select **CONNECTIVITY**, then **REMOVABLE MEDIA**. Properly label and Insert the backup media.

3.) Select the media type from the drop down menu.

4.) Enter the label for the media as shown in Figure 4-53. It is best to use all capital letters with no spaces or punctuation marks. Press **Format**.

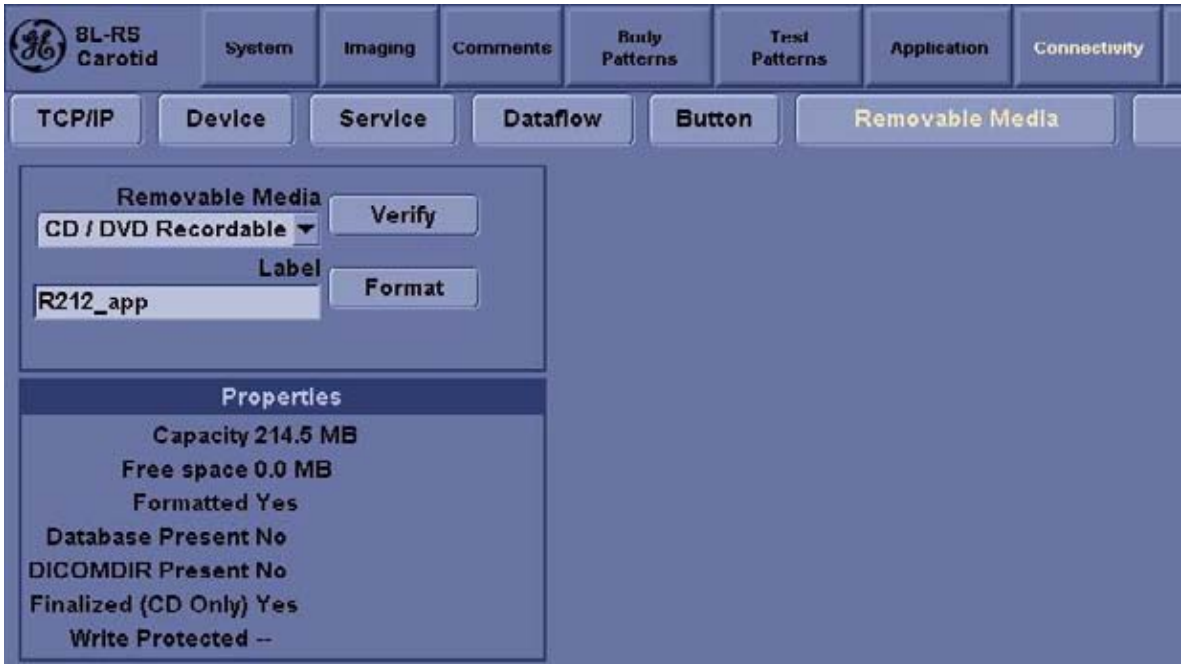


**Figure 4-53 Format and Verify Media**

5.) The Ultrasound system displays a pop-up menu, as shown in Figure 4-54. When the formatting has been completed, press **OK** to continue.

6.) If desired, verify that the format was successful by returning to *Utility>Connectivity>Tools* and selecting **VERIFY** as shown in Figure 4-53.

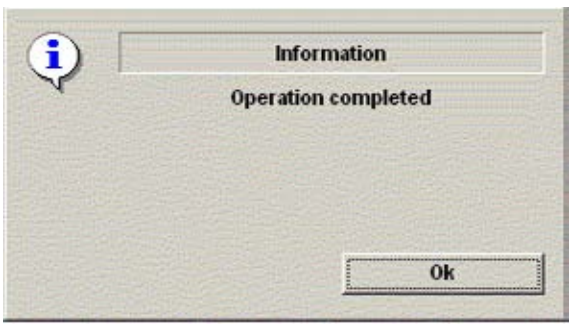


**Figure 4-54 Format Successful Pop-up Menu**

### 4-3-15-2 Backup System Presets and Configurations

*NOTE: Always backup any preset configurations before a software reload. This ensures that if the presets need to be reloaded, after the software update, they will be the same ones the customer was using prior to service.*

1.) Insert a formatted DVD into the drive.
2.) On the Keyboard, press **UTILITY**.
3.) On the LCD display, press **SYSTEM**.
4.) On the LCD display, select **BACKUP/RESTORE**.

*NOTE: If you are not logged in as GE Service or with administrator privileges, the Operator Login window is displayed. Log on with administrator privileges.*

5.) In the Backup list, select Patient Archive, Report Archive and User Defined Configuration.
6.) In the Media field, select DVD-RW (or USB memory device).
7.) Select **BACKUP**.

The system performs the backup. As it proceeds, status information is displayed on the Backup/Restore screen.

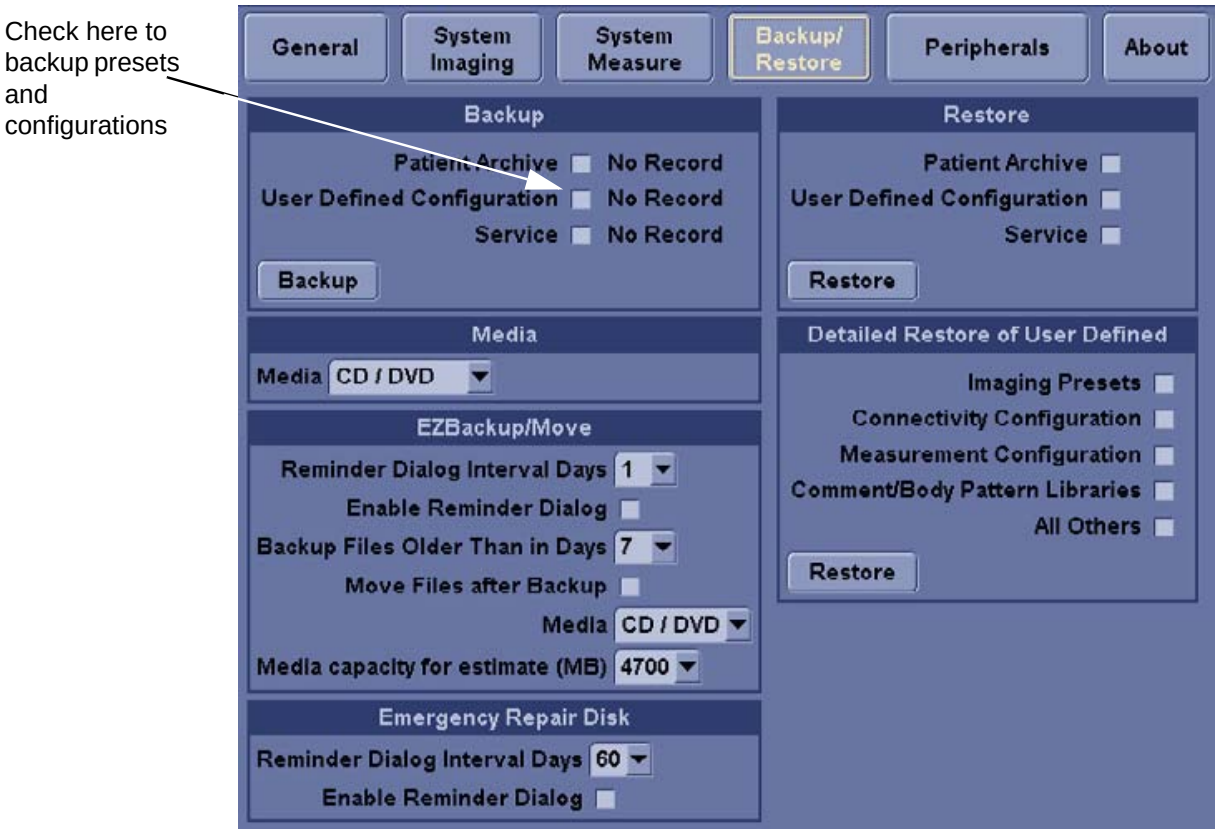


**Figure 4-55 Backup/Restore Menu**

### 4-3-15-3 Restore System Presets and Configurations

**CAUTION** The restore procedure **overwrites** the existing database on the local hard drive. Make sure to insert the correct DVD (or USB memory device).

1.) Insert the Backup/Restore DVD (or USB memory device) into the drive.
2.) On the Keyboard, press **UTILITY**.
3.) On the LCD display, press **SYSTEM**.
4.) On the LCD display, select **BACKUP/RESTORE**.

*NOTE: If you are not logged in with administrator privileges, the Operator Login window is displayed. Log on with administrator privileges.*

5.) In the Restore list, select Patient Archive, Report Archive and User Defined Configuration.
6.) In the Media field, select the Backup/Restore DVD-RW (or USB memory device).
7.) Select **RESTORE**.

The system performs the restore. As it proceeds, status information is displayed on the Backup/Restore screen.

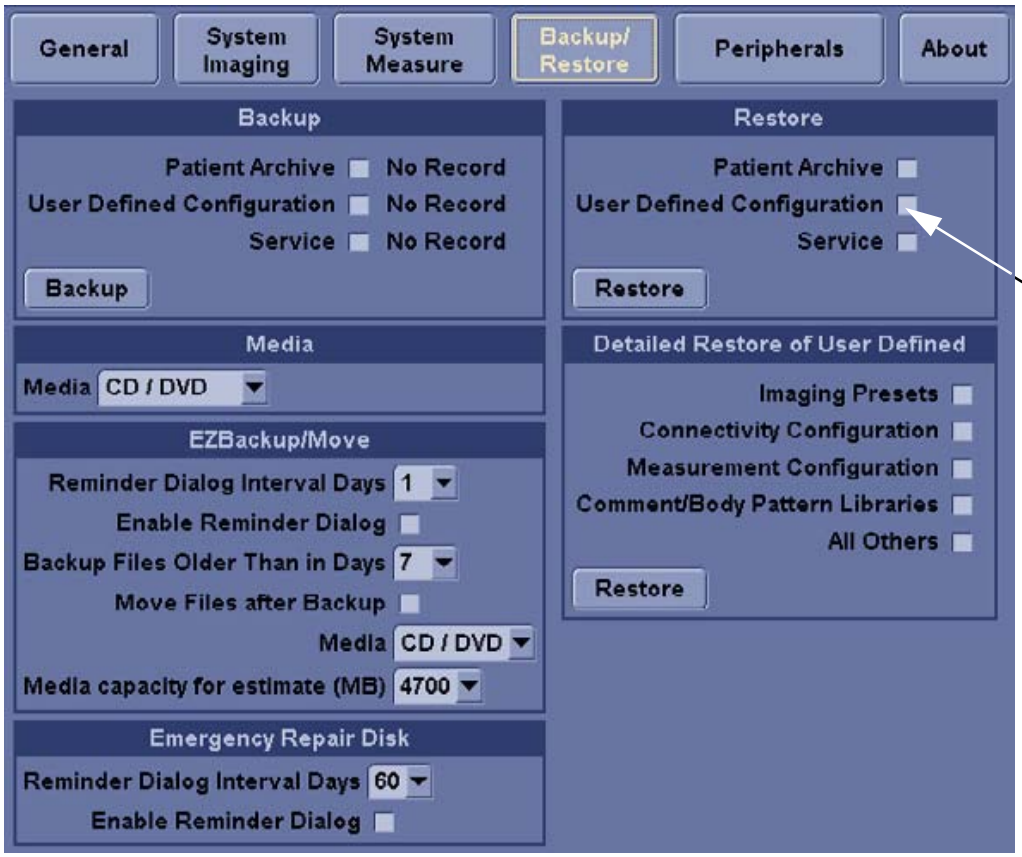


**Figure 4-56 Backup/Restore Menu**

### 4-3-15-4 Archiving Images

1.) Insert the archive media. To format the archive media, DVD-RW, select the Utility button on the Keyboard.

2.) Select Connectivity, then Tools.

3.) Format the DVD-RW. Verify the format if desired.

4.) Images will be moved from the hard drive by date. Therefore, the best way is to label media by date.

*NOTE: Images will be moved from the hard drive by date. Therefore, the best way to label media is by date. When images are moved to the archive media, they will be deleted from the system hard drive. However, the patient database (backed up earlier) maintains pointers to the location of the images on the archive media.*

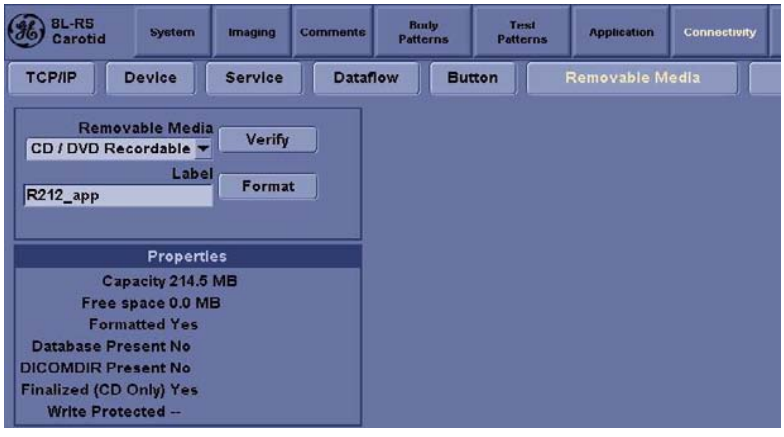


**Figure 4-57 Format DVD-RW Screen**

5.) Select Backup/Restore, then EZBackup/Move.

6.) Select “Backup File Older Than in Days”.

Choose the days which want to older than current exam date.

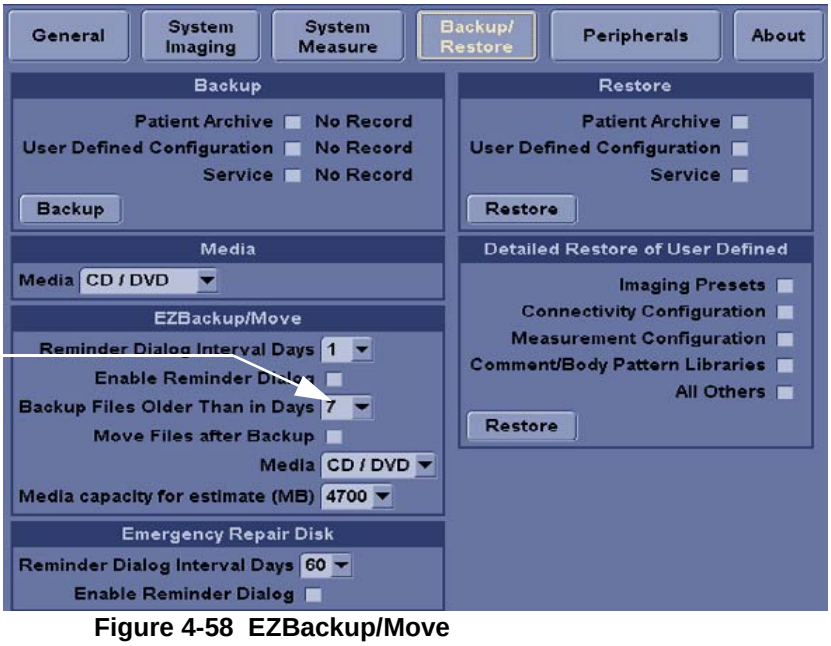


**Figure 4-58 EZBackup/Move**

**4-3-15-4 Archiving Images** (cont'd)

7.) Press **PATIENT** and set the Dataflow to store images directly to DVD-ROM.

8.) From the image screen, press **EZBACKUP/MOVE**. The Move Images pop-up appears.

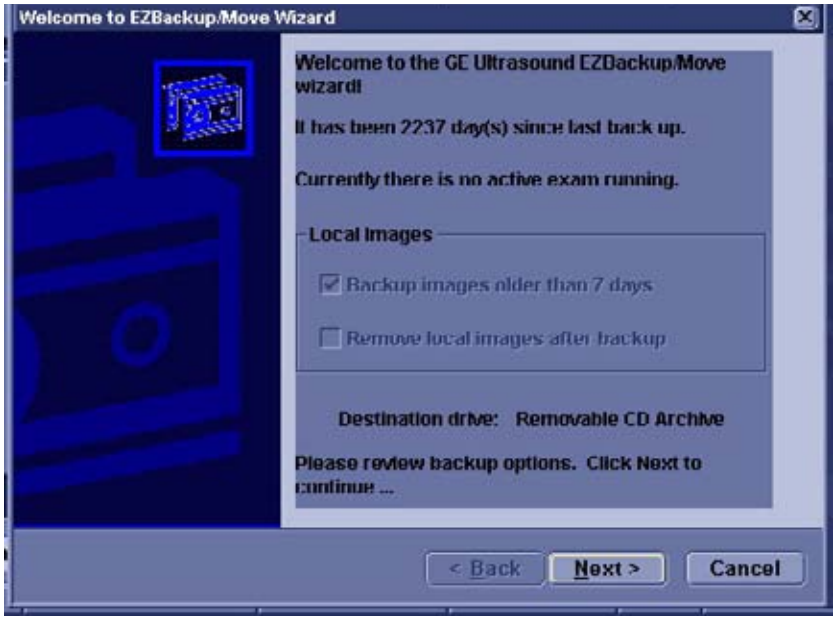
Welcome to EZBackup/Move Wizard
Welcome to the GE Ultrasound EZBackup/Move wizard!
It has been 2237 day(s) since last back up.
Currently there is no active exam running.
Local Images
Backup images older than 7 days
Remove local images after backup
Destination drive: Removable CD Archive
Please review backup options. Click Next to continue ...
< Back
Next >
Cancel

**Figure 4-59 Image Archive Move Pop-up Menu**

9.) Press **Next** on pop-up message.

10.) A media check message appears. Press **OK** to continue.

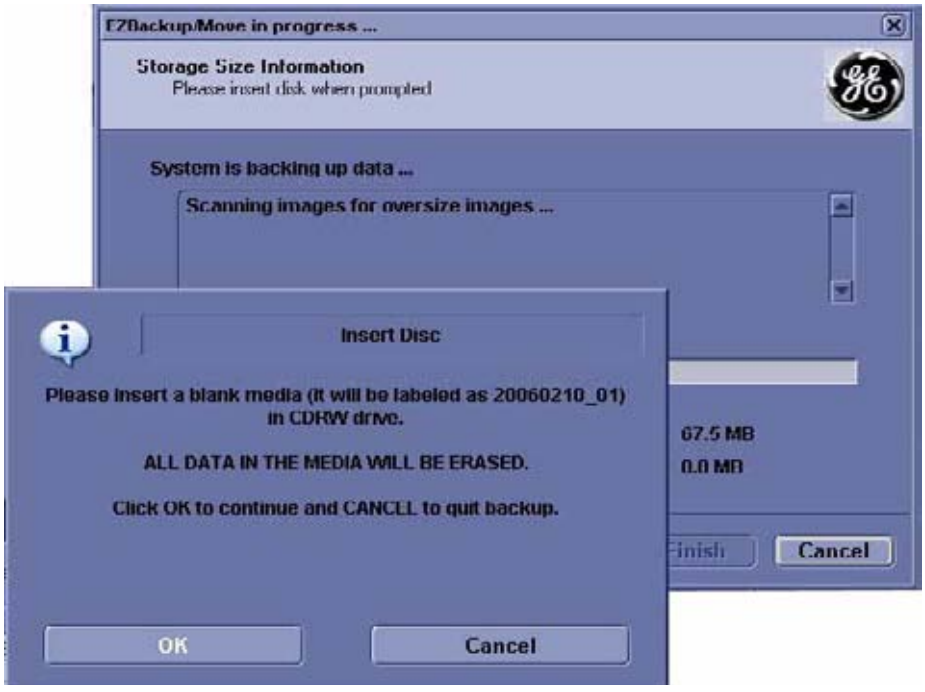
EZBackup/Move in progress ...
Storage Size Information
Please insert disk when prompted
System is backing up data ...
Scanning images for oversize images ...
67.5 MB
0.0 MB
Finish
Cancel
Insert Disc
Please insert a blank media (it will be labeled as 20060210_01) in CDRW drive.
ALL DATA IN THE MEDIA WILL BE ERASED.
Click OK to continue and CANCLL to quit backup.
OK
Cancel

**Figure 4-60 Media check message**

**4-3-15-4 Archiving Images** (cont'd)

11.) Press **Finish** after Backup/Move complete.

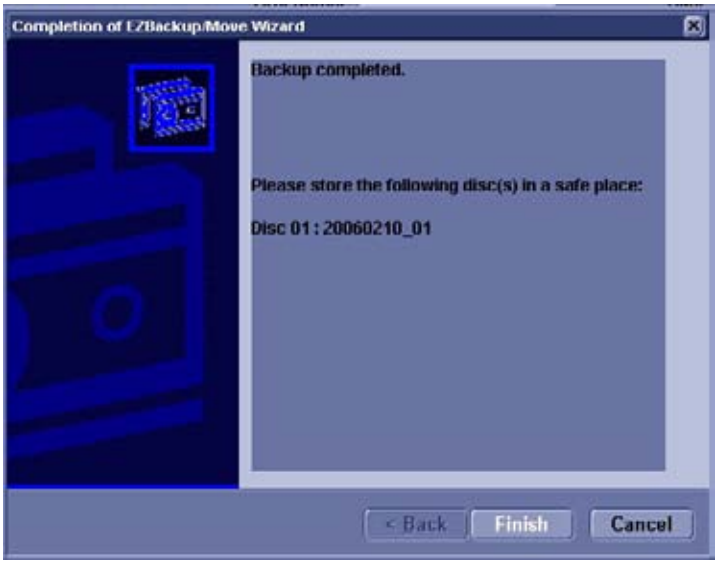


**Figure 4-61 EZBackup/Move complete**

All databases, presets and images should now be saved to removable media.

**4-3-15-5 Emergency Repair Disk**

1.) Connect the Emergency Repair Disk with system.

2.) Select Backup/Restore, then Emergency Repair Disk.

3.) Select "Reminder Dialog Interval Days".

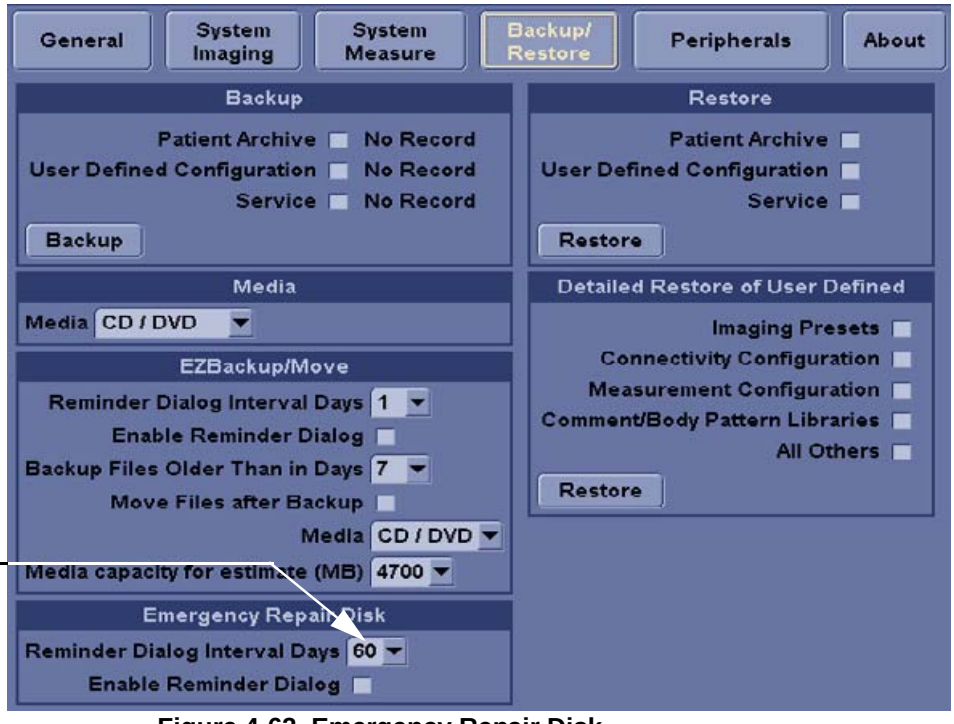


**Figure 4-62 Emergency Repair Disk**

**4-3-15-5 Emergency Repair Disk** (cont'd)

4.) Return to scan mode. Press Ctrl + B, the Emergency Disk Making window pop-up appears.

Welcome to Emergency Disk Making Wizard
Welcome to Emergency Disk Making Wizard!
NOTE: All data in the USB Emergency Disk will lost!!!
The Emergency Disk Making Wizard will help you create a copy of the information on your system hard disk.In the event that the original data on your hard disk is accidentally erased or overwritten, you can use the emergency disk to restore your lost or damaged data.We strongly recommend you to make an Emergency Repair Disk! Click Next to contine...
< Back
Next >
Cancel

**Figure 4-63 Emergency Disk Making Pop-up Menu**

5.) Press **Next** on pop-up message.

6.) A storage information message appears. Press **Next** to continue.

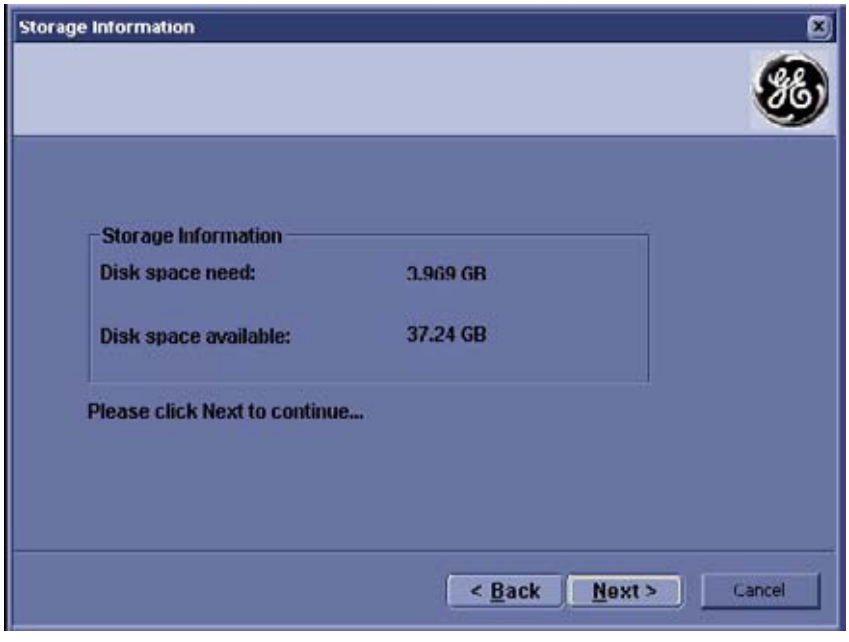


**Figure 4-64 Storage Information message**

**4-3-15-5 Emergency Repair Disk** (cont'd)

7.) Press **Finish** after Emergency Disk Making complete.

Completion of Emergency Disk Making Wizard!
Emergency Disk is OK now! Please click Finish to exit
NOTE: Stop the USB Emergency Repair Disk before unplug it!
< Back
Finish
Cancel

**Figure 4-65 Emergency Disk Making Complete**

All databases, presets and images should now be saved to Emergency Disk.

8.) Press Ctrl + R, Emergency Disk Recovery window pop-up appear.

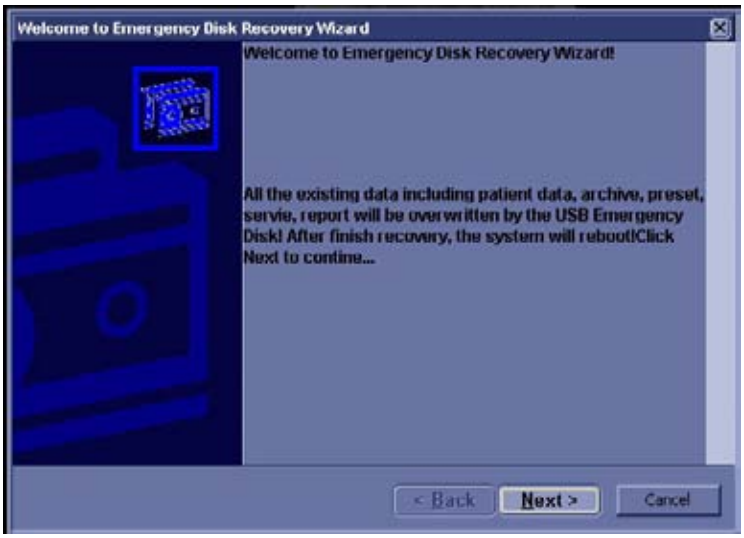
Welcome to Emergency Disk Recovery Wizard
Welcome to Emergency Disk Recovery Wizard!
All the existing data including patient data, archive, preset, servie, report will be overwritten by the USB Emergency Disk! After finish recovery, the system will reboot!Click Next to contine...
< Back
Next >
Cancel

**Figure 4-66 Emergency Disk Recovery**

9.) Press **Next** on pop-up message.

**4-3-15-5 Emergency Repair Disk** (cont'd)

10.) A recovery information message appears. Press **Next** to continue.

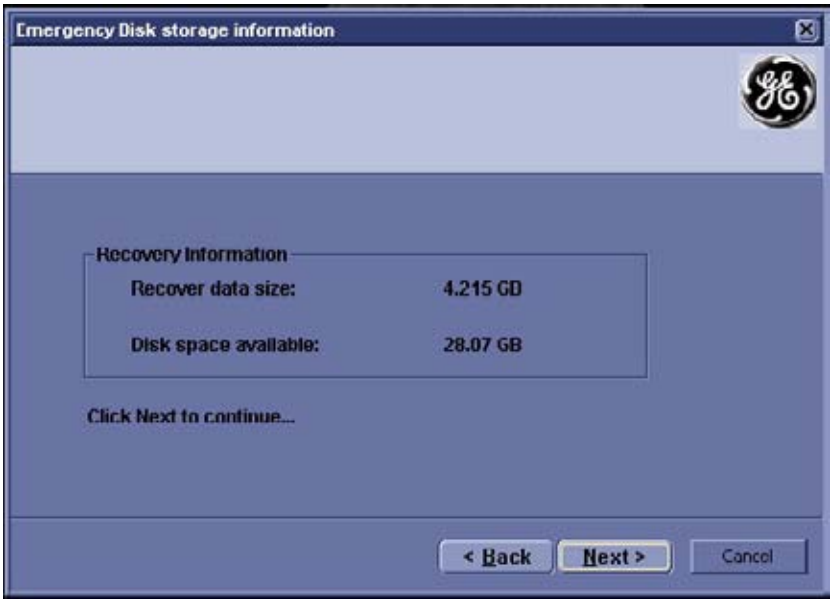


**Figure 4-67 Recovery Information message**

11.) Press **Finish** after Emergency Disk Recovery complete.

Completion of Emergency Disk Making Wizard!
Emergency Disk is OK now! Please click Finish to exit
NOTE: Stop the USB Emergency Repair Disk before unplug it!
< Back
Finish
Cancel

**Figure 4-68 Emergency Disk Recovery Complete**

# Section 4-4
# Software Configuration Checks

**Table 4-36 Software Configuration Checks**

| Step | Task to do | Expected Result(s) |
|---|---|---|
| 1. | Check Date and Time setting | Date and Time are correct |
| 2. | Check that Location (Hospital Name) is correct | Location Name is correct |
| 3. | Check Language settings | Desired Language is displayed |
| 4. | Check assignment of Printer Keys | The default function for Store Key and Print1-2 Keys is Store (store image); P1 (print); P2 (USB Quick Save). Store Key and Print1-2 Keys can also be assigned as desired by the customer |
| 5. | Check that all of the customer's options are set up correct | All authorized functions are enabled |

# Section 4-5
# Peripheral Checks

Check that peripherals work as described below:

**Table 4-37 Peripheral Checks**

| Step | Task to do | Expected Result(s) |
|---|---|---|
| 1. | Press (**FREEZE**) | Stop image acquisition. |
| 2. | Press (**P1**) on the Control Panel | The image displayed on the screen is printed on B&W printer. |
| 3. | Connect with Foot Switch on USB port and press once. | To start image acquisition (the same function as (**FREEZE**) key). |

# Chapter 5
# Components and Functions (Theory)

## Section 5-1
## Overview

This chapter explains Vivid™ e's system concepts, component arrangement, and subsystem function. It also describes the Power Distribution System (PDS) and probes.

**Table 5-38 Contents in Chapter 5**


| Section | Description | Page Number |
|---|---|---|
| 5-1 | Overview | 5-1 |
| 5-2 | Block Diagrams and Theory | 5-2 |
| 5-3 | PWA Assy Diagrams | 5-8 |
| 5-4 | Power Diagrams | 5-16 |
| 5-5 | Common Service Platform | 5-20 |

# Section 5-2
# Block Diagrams and Theory

## 5-2-1 Block Diagram

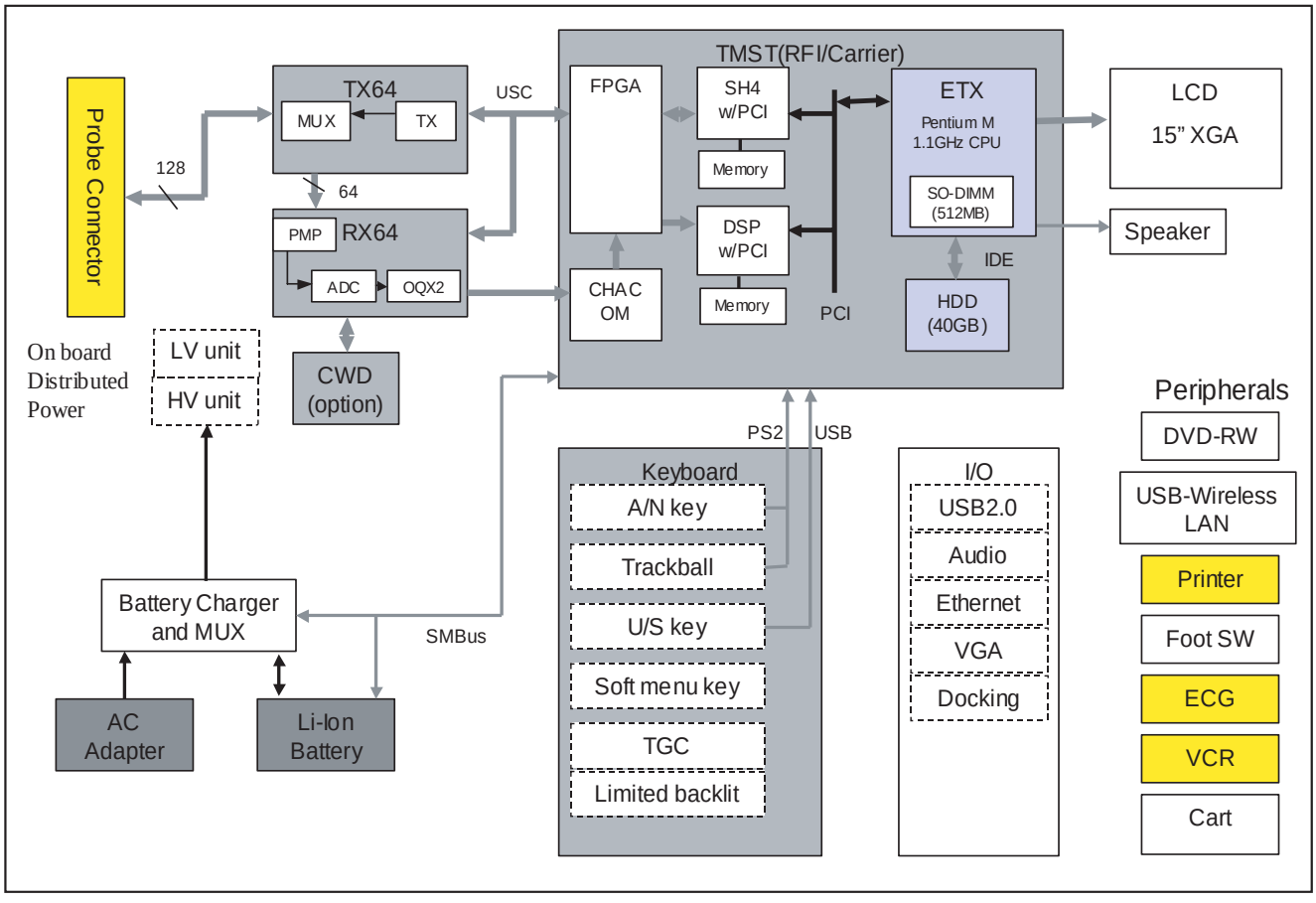


**Figure 5-69 Vivid™ e System Block Diagram**

- Pre Amp: Preamplifier
- OQX2: Beamforming ASIC
- CHACOM: B/M/CFM/DOP mode signal processor ASIC
- DSP: Digital Signal Processor with PCI interface between CPU and TMST
- HV unit: High voltage unit
- LV unit: Low voltage unit
- DC/DC & HV Ctrl, SMBUS I/F: DC/DC high voltage control smart bus interface
- TUSC FPGA: Vivid™ e Ultrasound controlling and Image data transfer FPGA

## 5-2-2 General Information

- Vivid™ e is an ultrasound imaging scanner.
- The system can be used for:
  - 2D Black and White imaging
  - 2D Color Flow
  - M-Mode Black and White imaging
  - Doppler
  - A number of combinations of the above
- Vivid™ e is a digital beam forming system that can handle up to 128 elements linear probes.
- Signal flow from the Probe Connector Panel to the Front End, to the Mid Processors and Back End Processor and finally to the LCD and peripherals.
- System configuration is stored on a hard disk and all necessary software is loaded from the hard disk on power up.

## 5-2-3 Front End

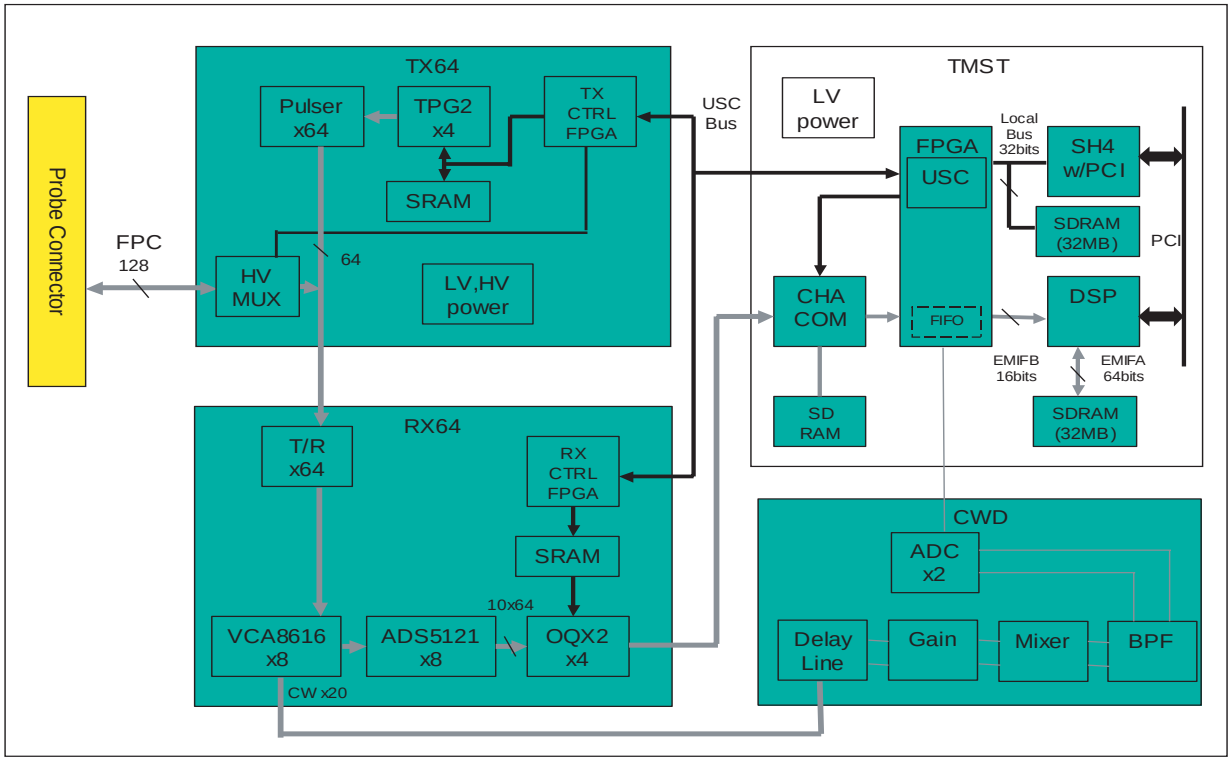


**Figure 5-70 The Front End**

The front end generates the strong transmit bursts, transmitted by the probes as ultrasound into the body. It also receives weak ultrasound echoes from blood cells and body structure, amplifies the signals and converts them to a 10bit digital signal.

The digital representation of the signal is presented to the mid processor section.

- PAM(PreAmplifier): The preamplifier amplifies 64 echo signals. The reception signals are sent to ADC on RX64.
- RX64 (Vivid™ e Front Processor): Convert the analog echo signal to digital.
- TX64 (Vivid™ e Transmission Board):This has 64 channel bipolar drivers.

## 5-2-4 The Back End

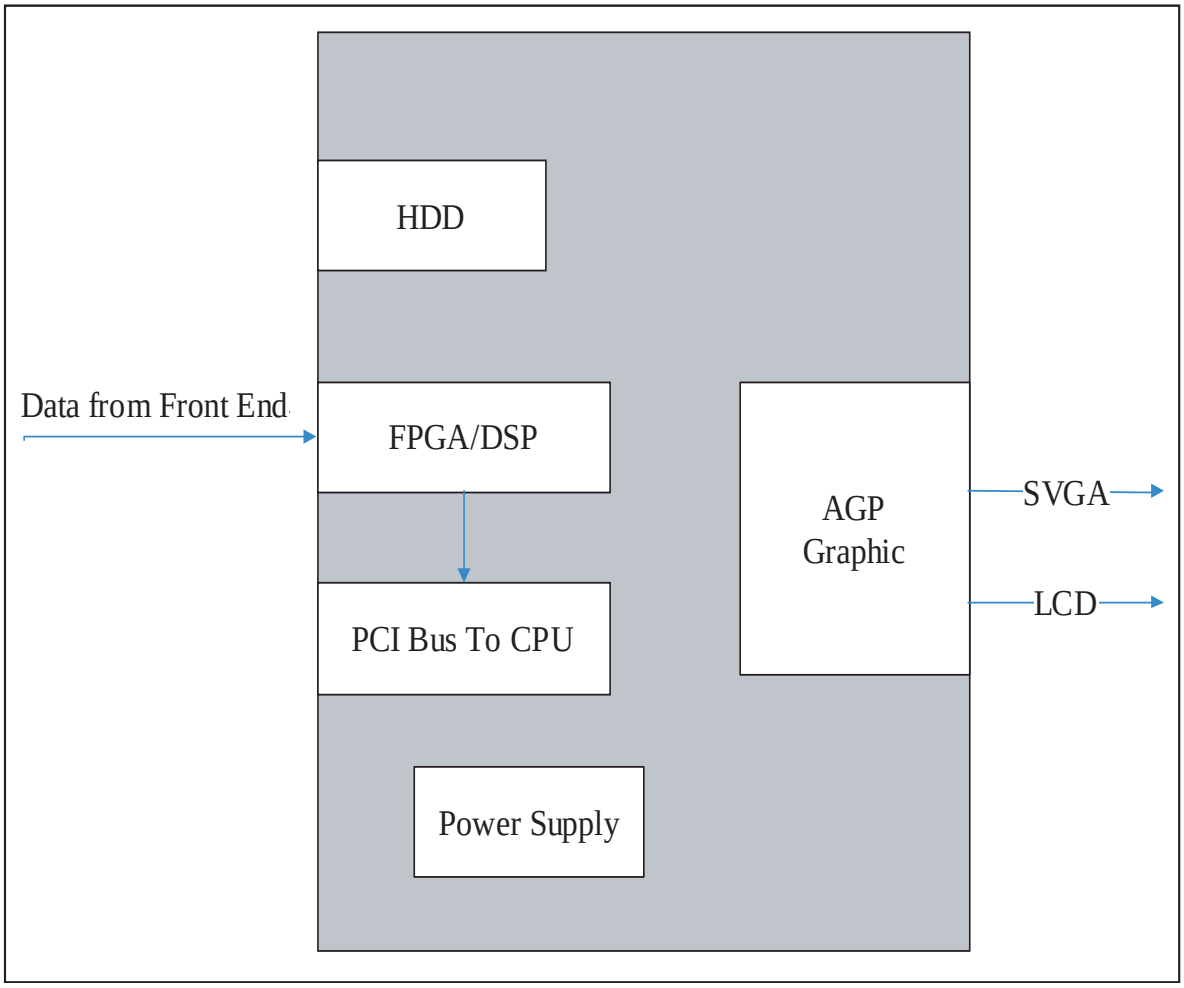


**Figure 5-71 The back end**

The Back End Processor grabs the data from the Image Port, stores it in a memory, performs scan conversion to pixel domain and drives the system LCD displayer.

**Storing Devices:**

Hard Disk Driver(HDD) (On the Back End Processor board)

## 5-2-5 Top Console

The Top Console includes a Standby/On switch, a keyboard, different controls for manipulating the picture quality, controls for use in Measure & Analyze (M&A), and loudspeakers for stereo sound output (used during Doppler scanning).

## 5-2-6 External I/O

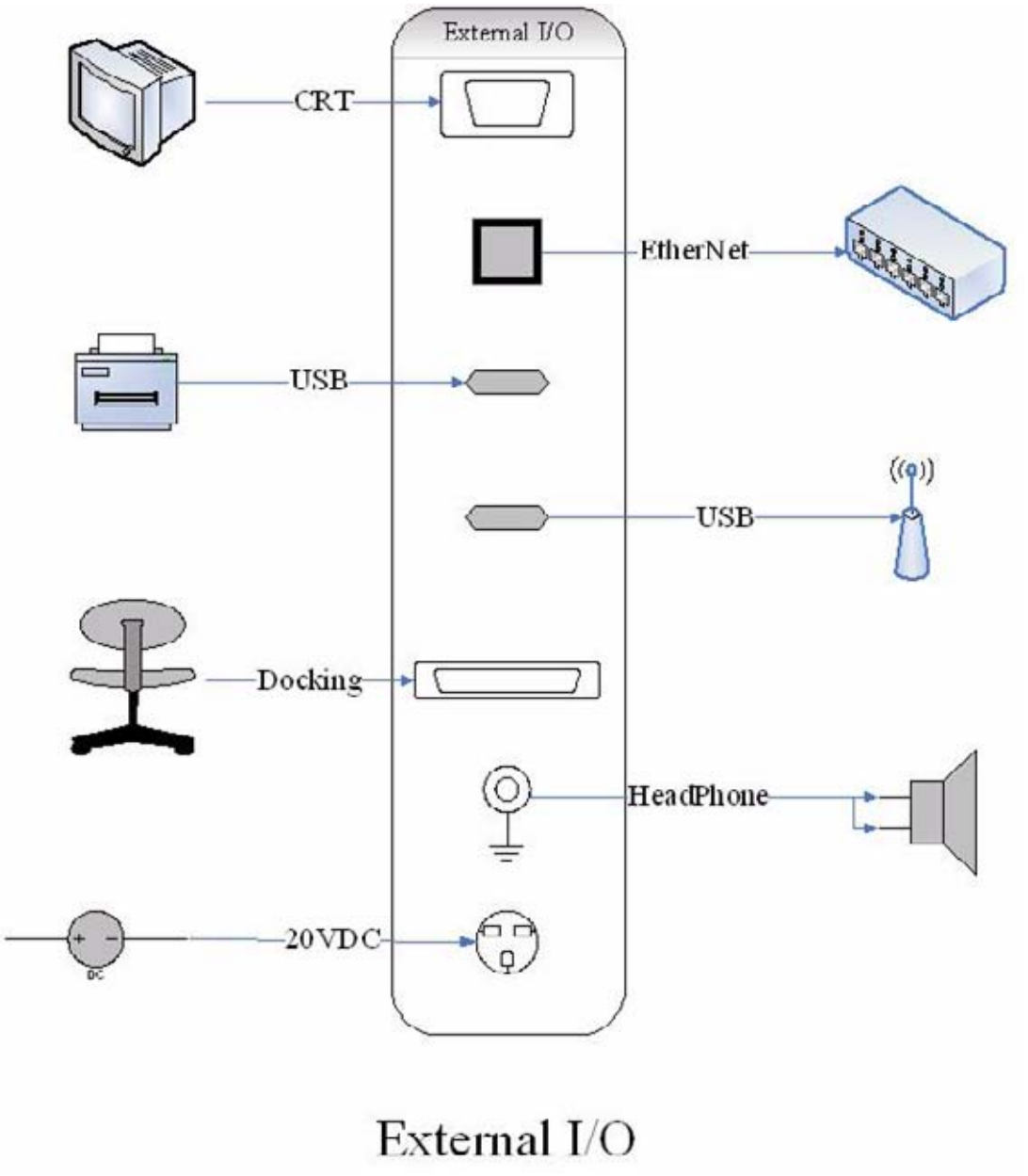


**Figure 5-72 External I/O module overview**

External I/O:

The external I/O is the interface between the scanner and all external items. Examples: wireless network, USB interface medical grade printer and external medical grade SVGA displayer.

## 5-2-7 Peripherals

DVD-RW, and a Black & White Video Printer can be connected to the external I/O.

## 5-2-8 Wiring

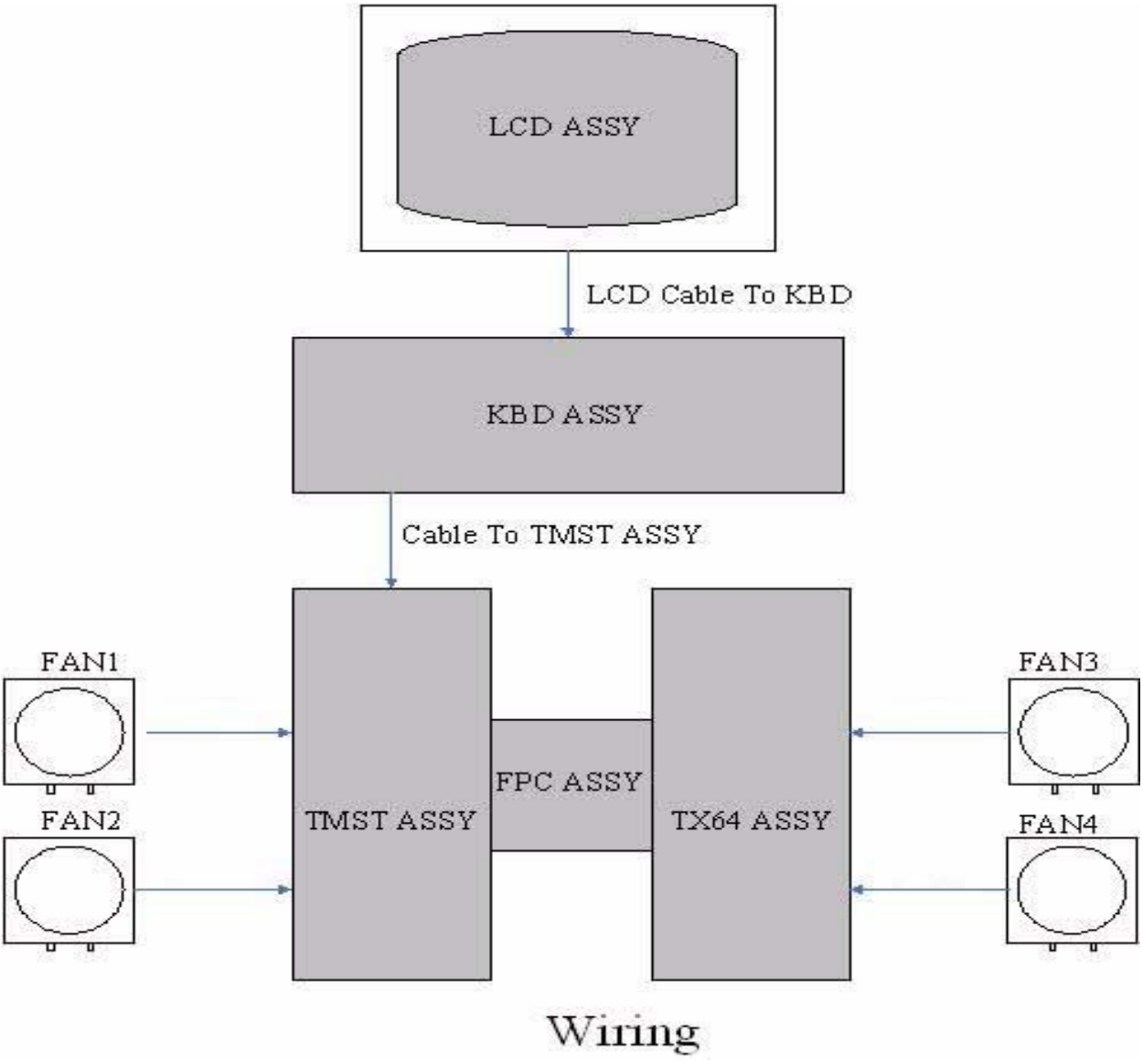


**Figure 5-73 Wiring Diagram**

- TX64: Vivid™ e Transmit board
- RX64: Vivid™ e Front end processing board
- TMST: Vivid™ e Master board
- PWR SW: Power Switch
- FPC: Flexible Print Circuit board

# Section 5-3
# PWA Assy Diagrams

## 5-3-1 TMST

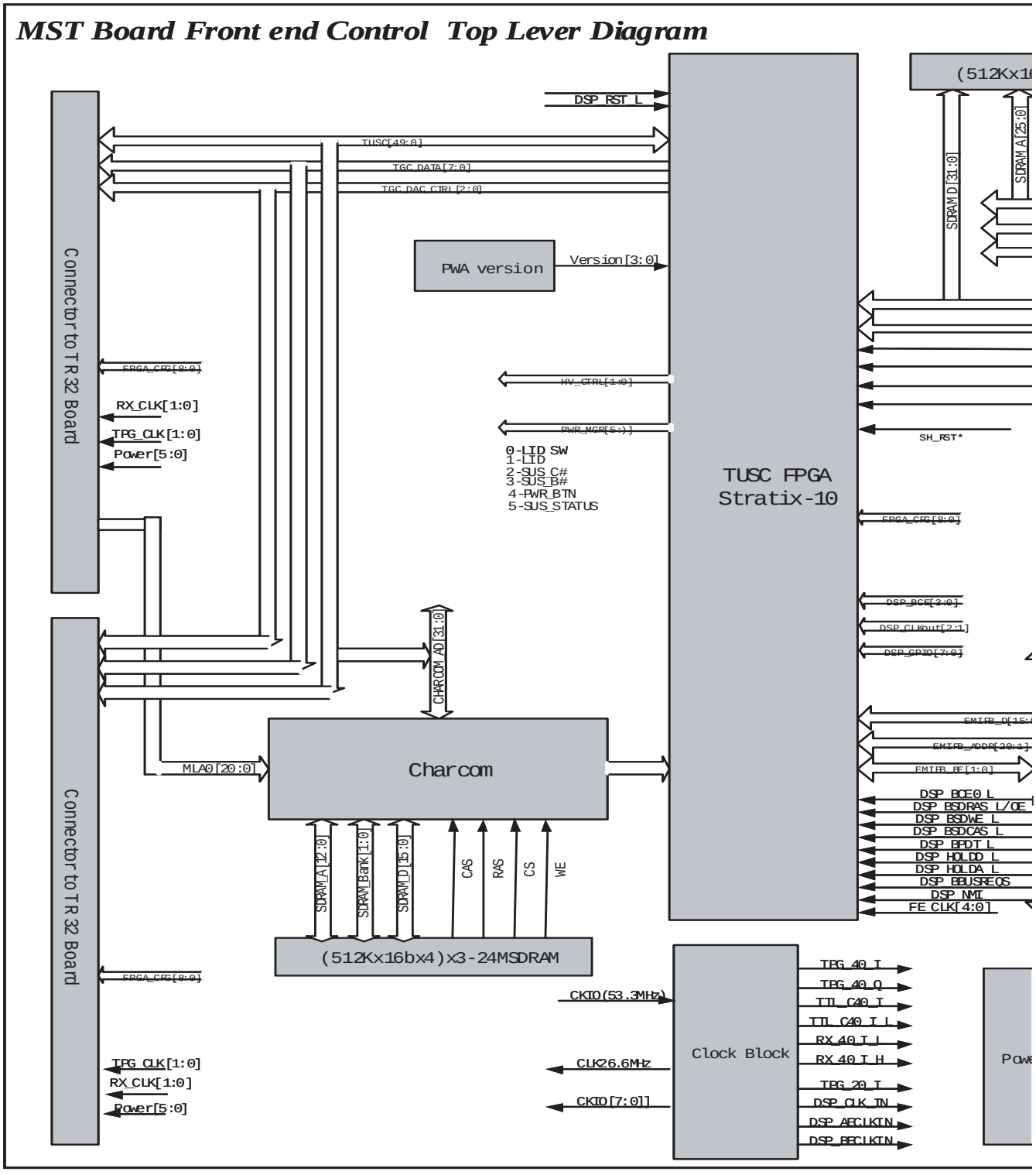


**Figure 5-74 TMST Block Diagram**

## 5-3-1 TMST (cont'd)

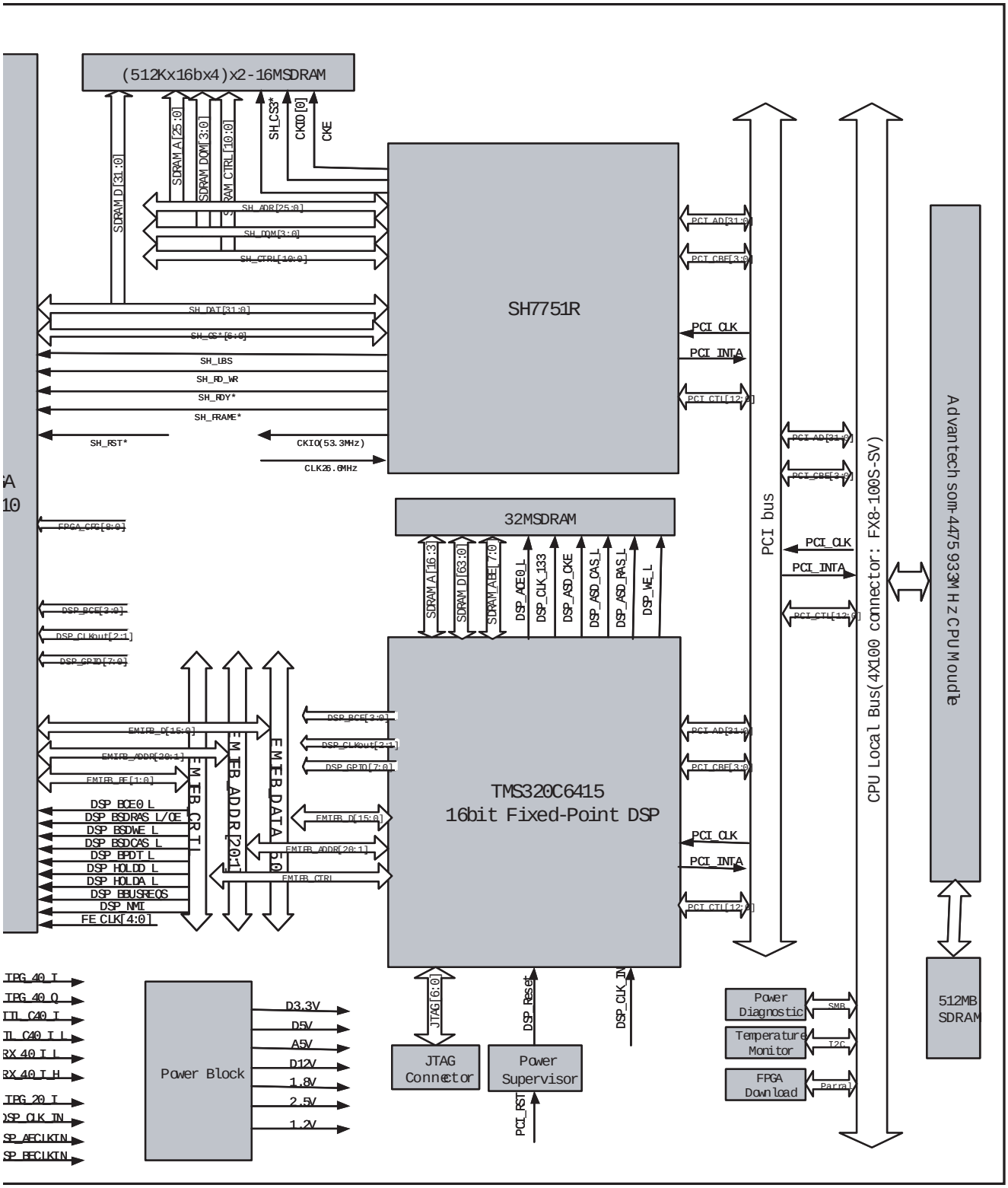


**Figure 5-75 TMST Block Diagram(con't)**

## 5-3-1 TMST (cont'd)

- EPLD: Programmable logic device
- SH4: Front controlling CPU
- PWR_DIAG: Power diagnostic circuit
- ETX: Card CPU unit

### 5-3-1-1 Description

This diagram describes the TMST board. It controls the front end of Vivid™ e and also communicate with PC system through PCI interface.

The main function:

- Generate clock signal and distributing each clock signal.
- Generate DUSC bus cycle.
- Power diagnostics: HV, LV.
- Transmit image raw data (B/CFM/DOP) to PC after assembling packet including header information.

## 5-3-2 RX64

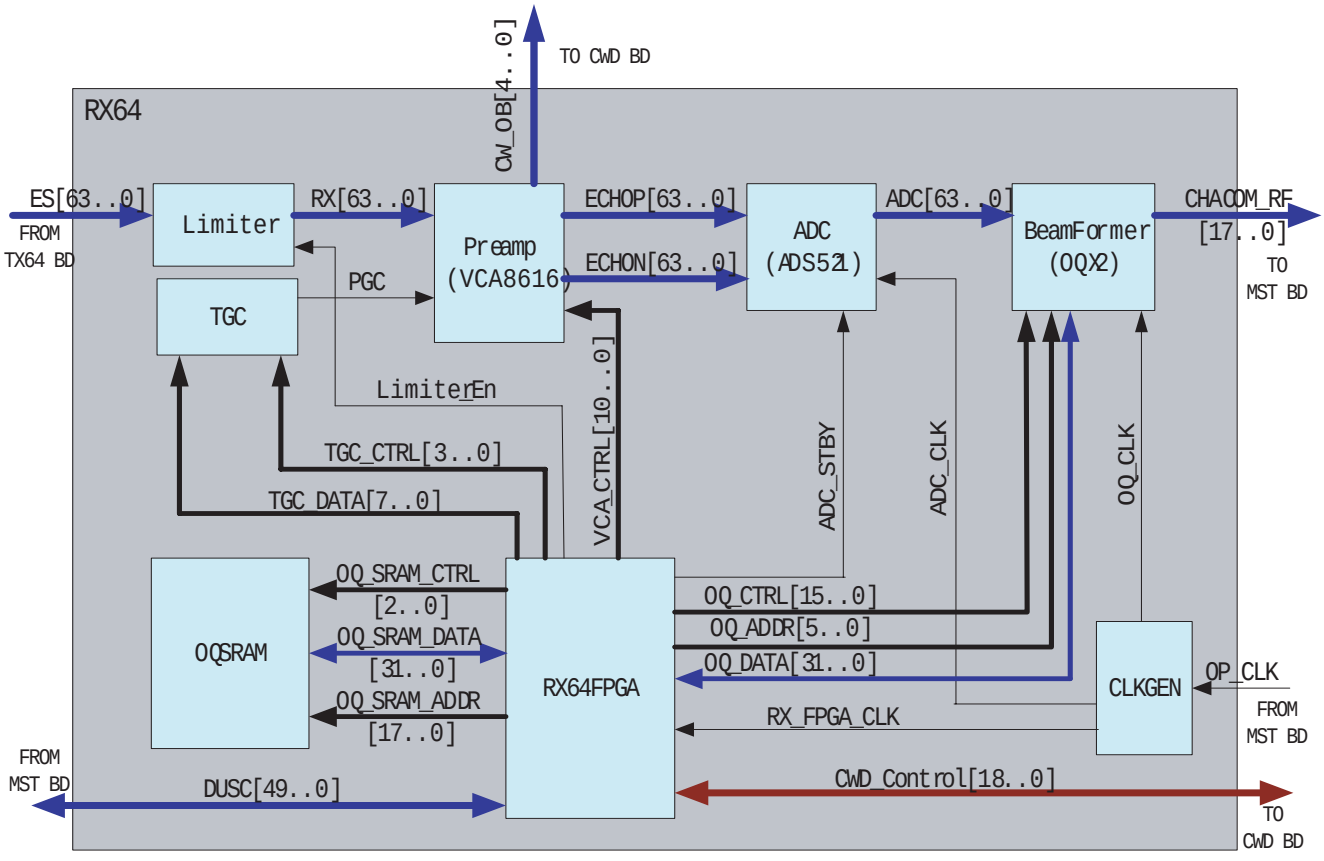


**Figure 5-76 RX64 Block Diagram**

- RX64: Vivid™ e Front End Processor board
- ADC: Analog/Digital converter
- OQX2: Beamform ASIC
- CHACOM: B/M/CFM/Dop signal processor ASIC
- FPIC FPGA: Front Process interface control

### 5-3-2-1 Description

This diagram describes the RX64(Front Process) board. It resides below TMST board (located at the bottom layer).

The main function:

- Convertor 64 channels echo which is from preamp to digital signal.
- Focus the received RF signals by digital beamforming technology.
- Control CHACOM to acquire optimum image data.

## 5-3-3 TX64

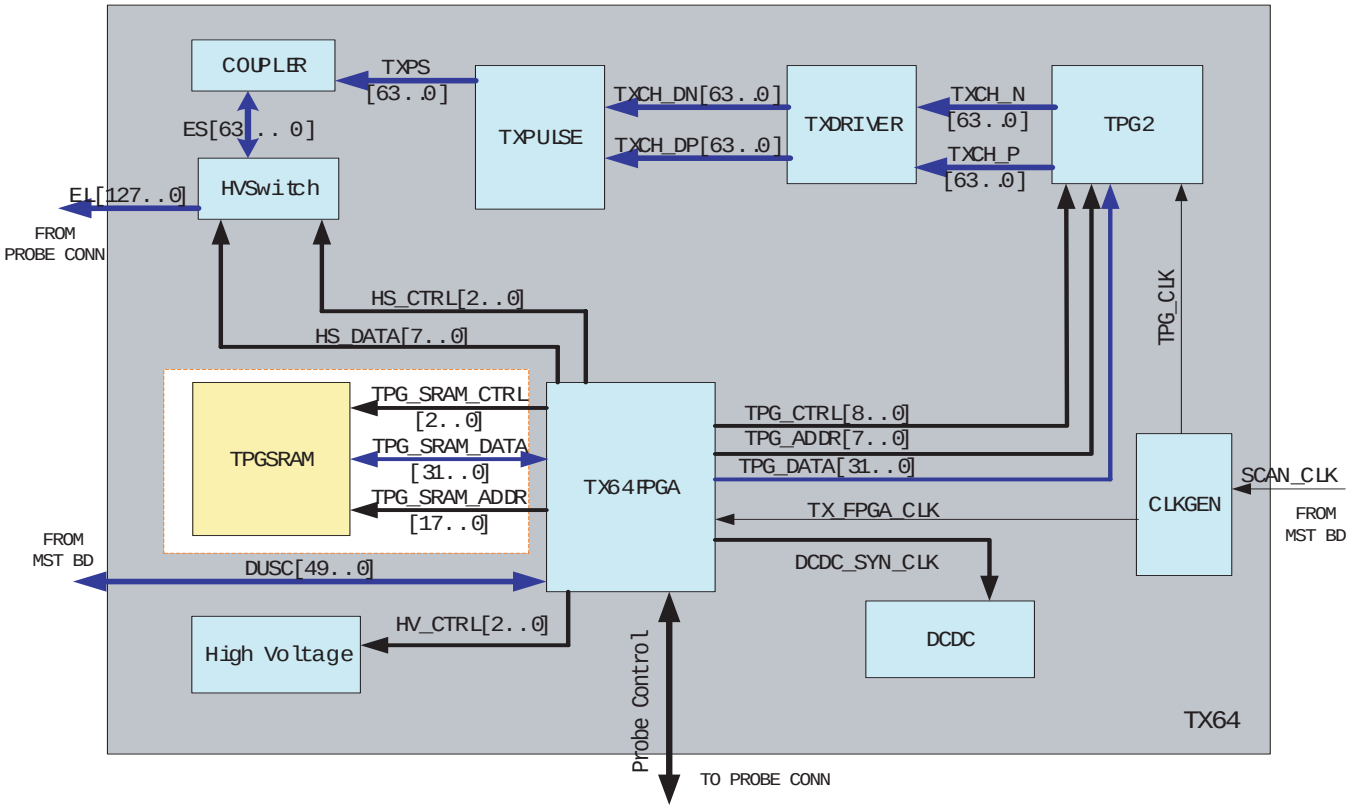


**Figure 5-77 TX64 Block Diagram**

- TX64: Vivid™ e Transmit board
- TPG2: Transmit Pulse Generator
- TMST: Vivid™ e Master board
- TXMX FPGA: Transmit and MUX controlling FPGA

### 5-3-3-1 Description

This diagram describes Vivid™ e TX64 board, it resides between TMST board.

The main function:

- Generate the transmit pulse.
- Drive the Tx pulse with high voltage.

## 5-3-4 CWD

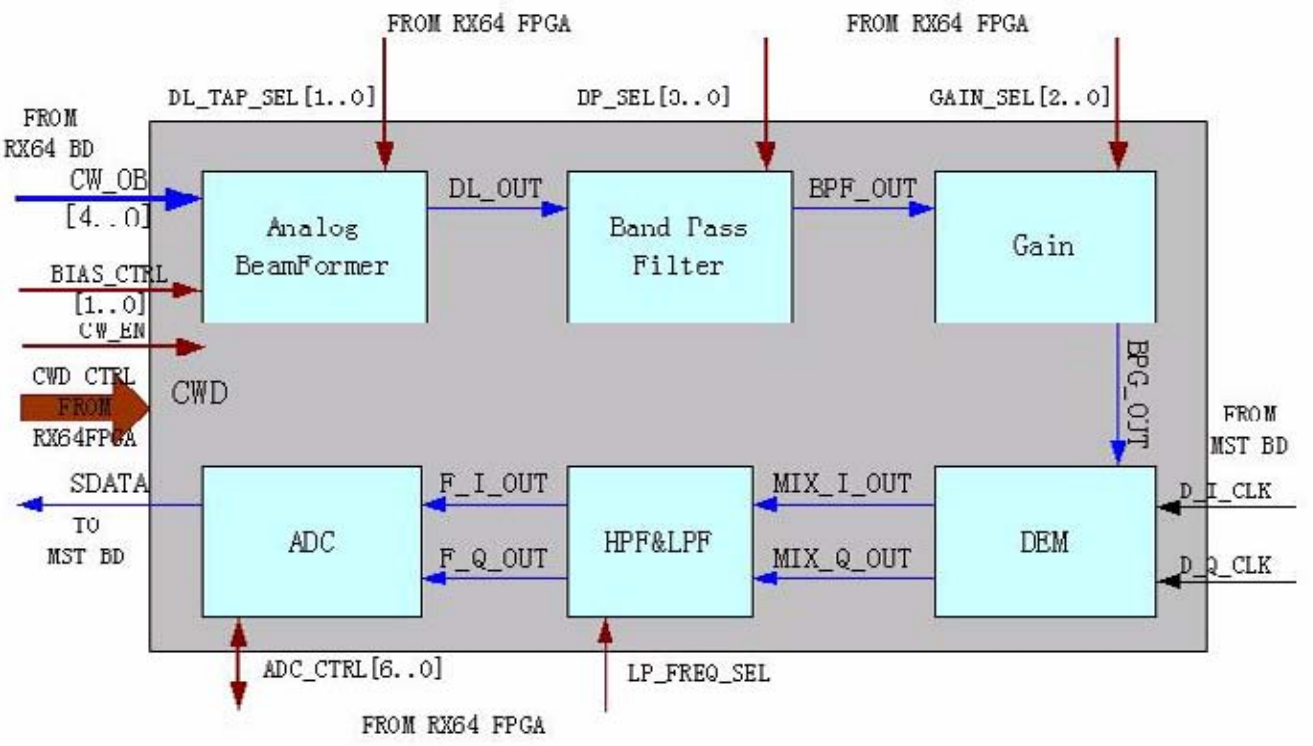


**Figure 5-78 CWD Block Diagram**

- CWD: Continue wave doppler board
- DEM: Demodulator
- HPF: High pass filter
- LPF: Low pass filter

### 5-3-4-1 Description

This diagram describes Vivid™ e CWD board, it resides under RX64 board.

The main function:

- Generate continue wave form image data.

## 5-3-5 Keyboard

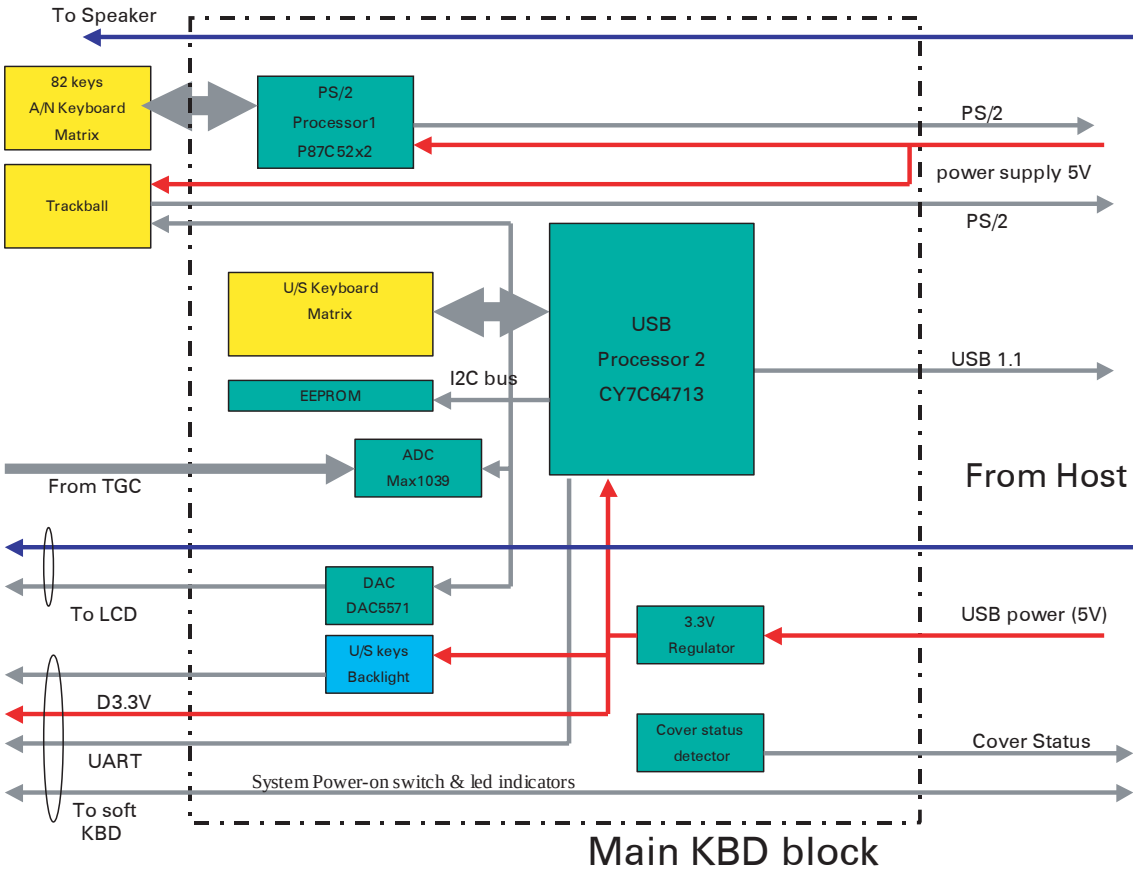


**Figure 5-79 Keyboard Block Diagram**

### 5-3-5-1 Scan Control Board LEDs

**Table 5-39 LED Indications**

| Function Module | LED Location | LED Color | LED Function |
|---|---|---|---|
| **Control panel** | **1st from left** | **Green** | **HDD activity** |
| | **2nd** | **Green** | **Main Power activity** |
| | **3rd** | **Green/Orange** | **Green indicates battery charging.**<br>Orange indicates battery is low |
| | **4th** | **N/A** | **N/A** |
| **TMST** | **DS5** | **Green** | **FPGA Config** |
| | **DS3** | **Green** | SH4 status:<br>HH: Reset<br>HL: Standby<br>LH: Sleep<br>LL: Normal operation |
| | **DS4** | **Green** | |
| **RX64** | **DS1** | **Green** | **FPGA Config** |
| **TX64** | **DS1** | **Green** | **FPGA Config** |

# Section 5-4
# Power Diagrams

## 5-4-1 Overview

The AC Power assy's main tasks are to isolate and output to the DC/DC unit which is inside the system console. The input of AC power pack will be the AC outlet and it's universal, the range is AC 90V-264V, 47-63Hz. And no main power switch located on this power pack.

## 5-4-2 AC Power

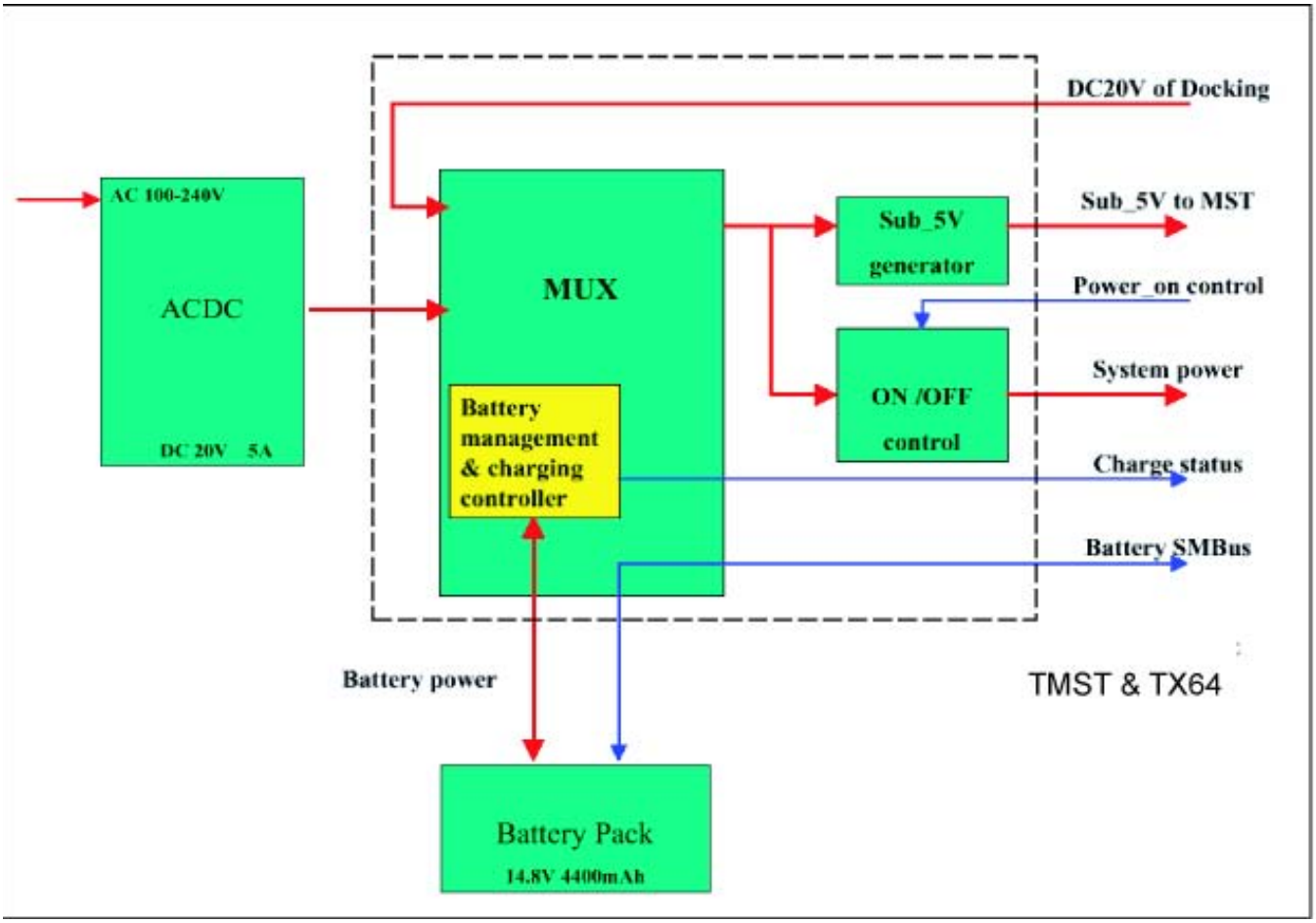


**Figure 5-80 AC Power Distribution Block Diagram**

The mains cord has plugs in one side end. A male plug connects to the mains outlet on site.

The mains voltage is routed to the AC power pack through a Circuit Breaker located on the site.

The Circuit Breaker is of the auto fuse type, if for some reason the current grows to high, the switch will automatically break the power.

From the Main Circuit Breaker, the AC power is routed via an Inrush Current Limiter to a internal outlet connector for the Mains Transformer.

### 5-4-3 Battery charging

The charging circuit is lithium-Ion battery charge and discharge controller. This block can switch the power between the battery and the output of AC Pack. If the output of AC Pack is available, the power input of Charge Board Unit should be from the AC Pack and the battery will be charged if it's not full. This block will be also in charge of the battery charging monitor to avoid the battery over heat and over charging, charging will be shut off automatically if battery is charged fully. The battery will discharge to provide the power to the system when out of AC power pack output or AC line.

## 5-4-4 Air Flow Distribution

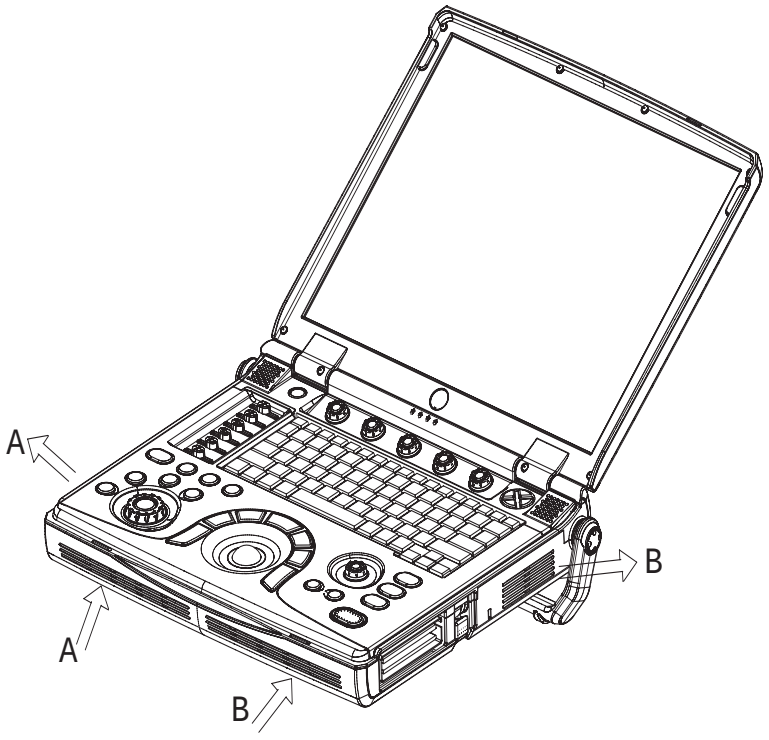


**Figure 5-81 Air Flow Inside the Scanner**

The two air flow passes allow the scanner to be cooled down as shown in the figure above.

- Path A (Bottom front > CPU Assy > Bottom left) for TMST & CPU Assy cooling.
- Path B (Bottom front > TX64/RX64 > Bottom right) for TX64/RX64 cooling.

## 5-4-5 Fans

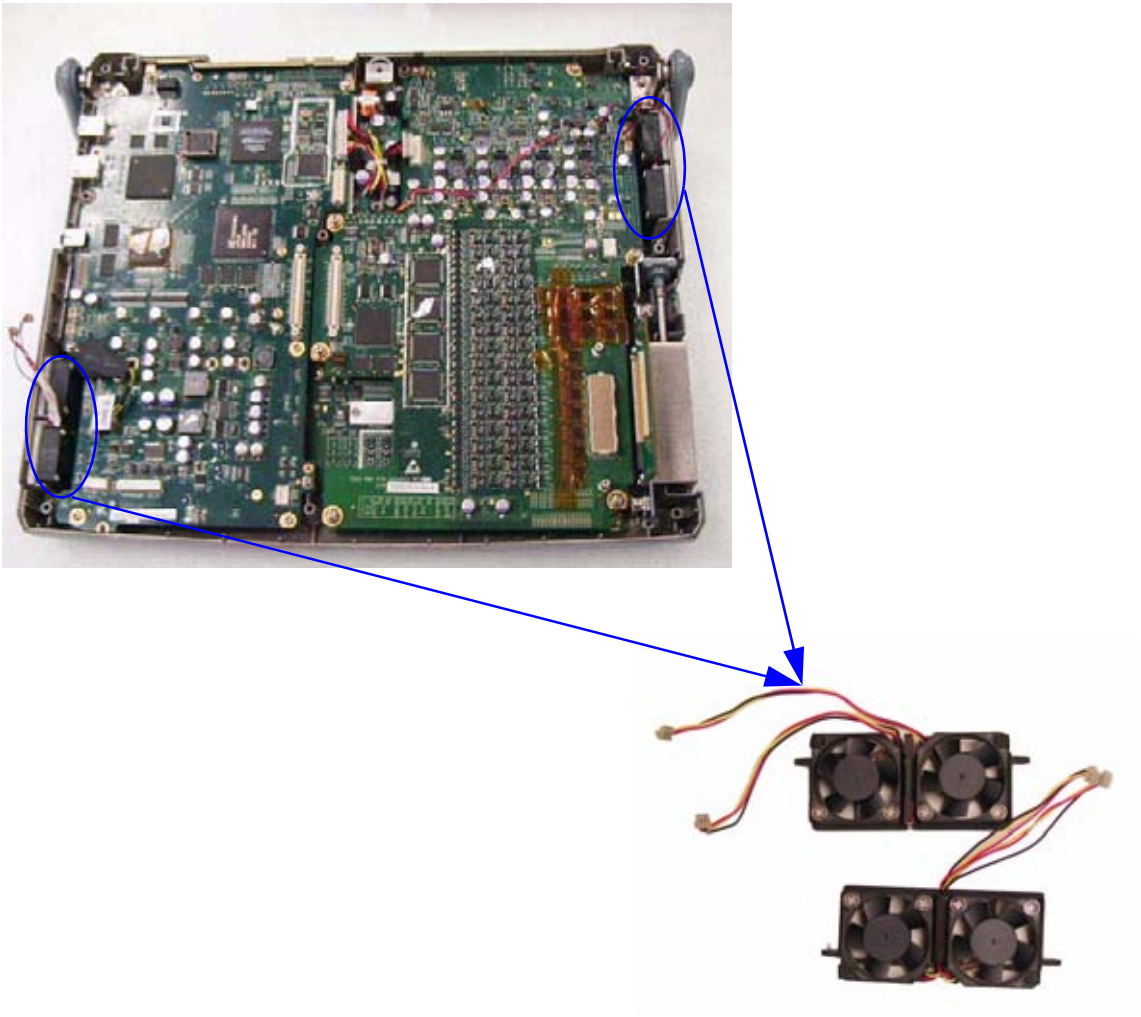

**Figure 5-82 Left & Right Fans**

The scanner contains the four fans at the following positions for producing an air flow.

- One fan assy: On the Left side for air flow path A.
- One fan assy: On the Right side for air flow path B.

# Section 5-5
# Common Service Platform

## 5-5-1 Introduction

The Service Platform contains a set of software modules that are common to all PC backend ultrasound and cardiology systems. The Common Service Platform will increase service productivity and reduce training and service costs.

## 5-5-2 Global Service User Interface (GSUI)

### 5-5-2-1 Internationalization

The user interface provided by the service platform is designed for GE personnel and as such is in English only. There is no multi-lingual capability built into the Service Interface.

### 5-5-2-2 Service Login

Select Utility-Service. This button links the user to the service login screen.

**Figure 5-83 Service Login Screen**

### 5-5-2-3 Access / Security

The service interface has different access and security user levels. Each user is only granted access to the tools that are authorized for their use.

### 5-5-2-3 Access / Security (cont'd)

**Table 5-40 Service Login User Levels**

| User Level | Access Authorization | Password |
|---|---|---|
| Operator | Authorized access to specified diagnostics, error logs and utilities. Same acquisition diagnostic tests as GE Service. | uls |
| Administrator | | uls |
| External Service | | gogems |

Every access request, whether successful or not, will be logged into a service access log that is viewable to authorized users.

### 5-5-2-4 The usage for security cable

The ultrasound system equipped with Kensington security slot which is compatible with a Kensington security cable, refer toFigure 5-84 on page 21 .

**Figure 5-84 Kensington security slot**

How to prevent unauthorized removal of the ultrasound system?

1.) Wrap the cable around the immovable object, refer to Figure 5-85 on page 21 ;
2.) Make sure and rotate the key to the right (unlocked position);
3.) Insert the lock into the Kensington security slot in the system side cover, refer to Figure 5-85 on page 21 ;
4.) Rotate the key to the left (locked position).
5.) For more information, visit www.kensington.com.

**Figure 5-85 Kensington security slot and system**

## 5-5-3 Service Home Page

The navigation bar at the top of the screen allows the user to select from several tools and utilities.

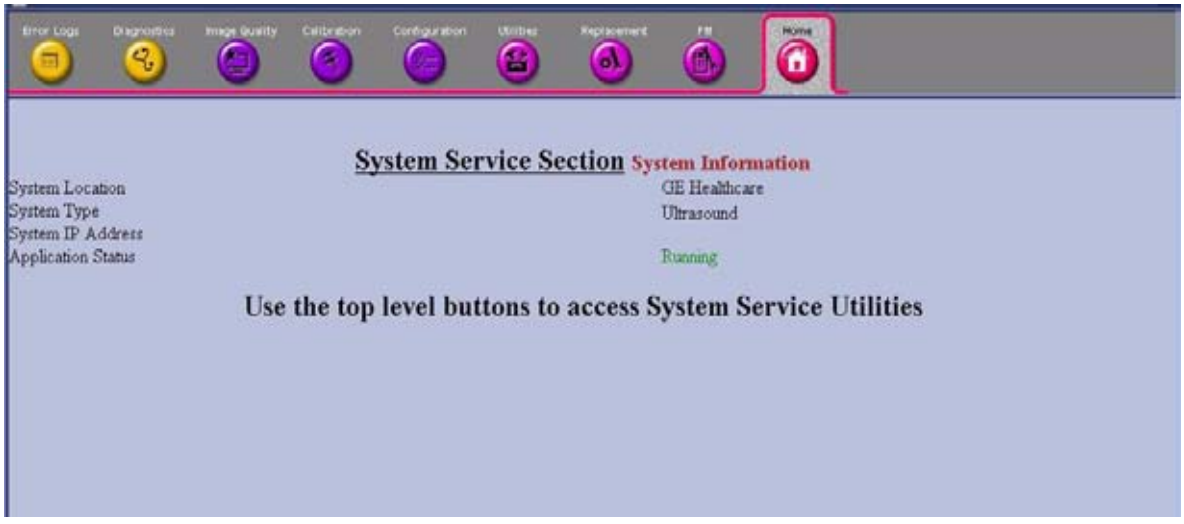


**Figure 5-86 Customer Service Home Page**

## 5-5-4 Error Logs Tab

From the Error Logs Tab the Log Viewer displays four categories with pull-down sub-menus and an Exit selection. The Service Interface allows scanner logs to be viewed by all service users.

The **Filter** Error log is not available to customer level analysis.

The log entries are color-coded to identify the error level severity at a glance.

**Table 5-41 Log Entry Key**

| Severity | Error Level | Color Code |
|---|---|---|
| 1 | Information | Green |
| 2 | Warning | Blue |
| 3 | Error | Red |

The Service Interface supports the transfer of these logs to local destinations such as the CD-ROM drive.

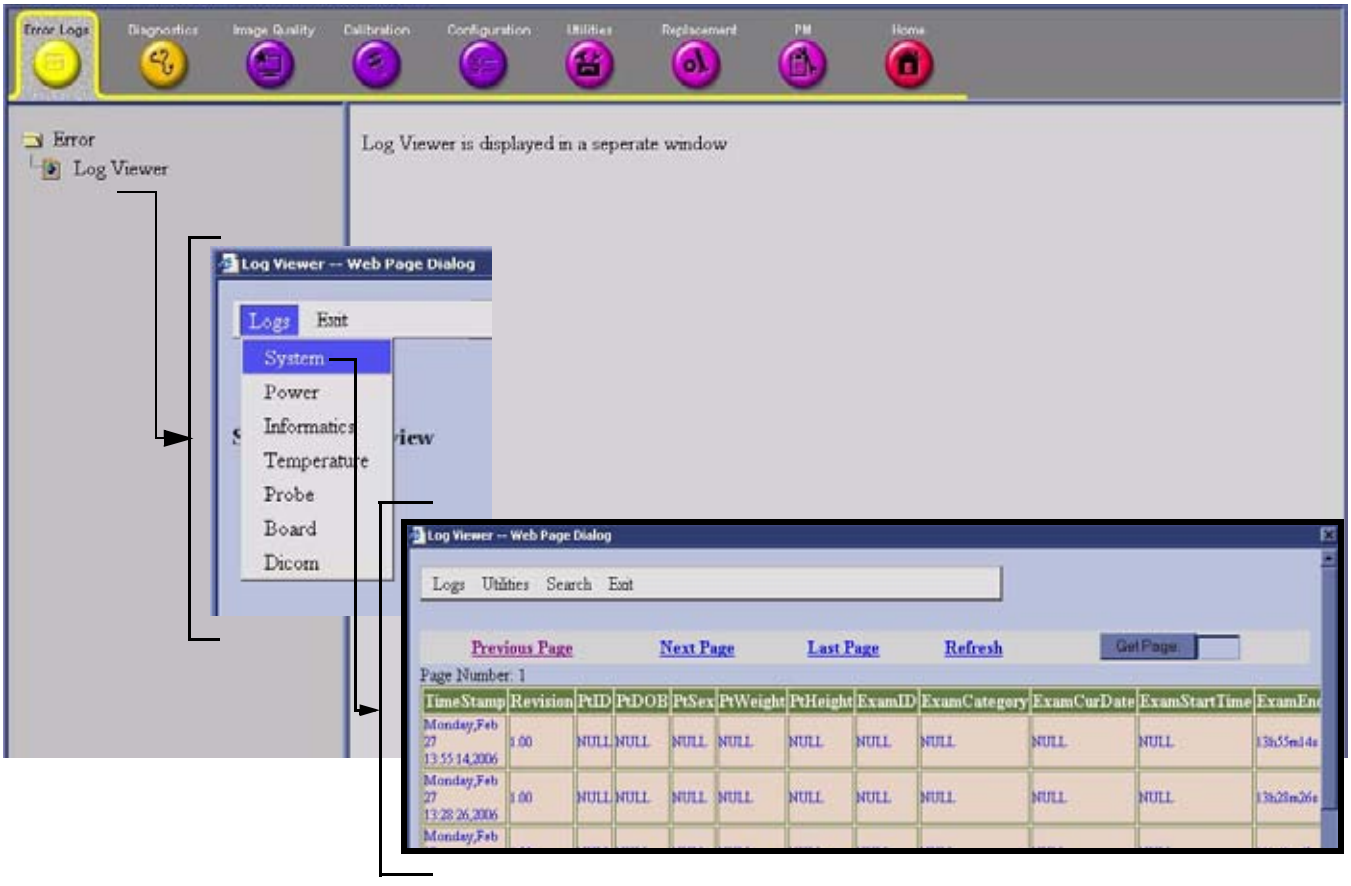


**Figure 5-87 Log Viewer / Logs / Log Entries**

### 5-5-4-1 Logs

The seven sub-menus of the Logs category are System, Power, Infomatics, Temperature, Probe, Board, and DICOM.

*NOTE: Figure 5-87 provides a graphical example of the log entries for the **System Logs**.*

Log table headings for the different logs are as follows:

- **System**

  Log entry headings include Time Stamp; Error Level; Package; and Error Message.

- **Power**

  Log entry headings include Time Stamp; Error Level; Package; and Error Message.

- **Infomatics**

  Log entry headings include TimeStamp, Revision, PtID, PtDOB, PtSex, PtWeight, PtHeight, ExamID, Exam Category, ExamCurDate, ExamStartTime, ExamEndTime, FreezeTime, TimeOfImageArchived, AccessionNumber, RefPhyName, ReadingPhyName, Operator, RoomNo, BodyPatternSelected, InstitutionName, ActiveModeTime, CalculationMade, CalculationTime, HelpUsage, ProductName, SystemSWRev, NoOfSWModules, SystemPowerOnTime, SystemIdleTime, NoOfBoards, ProbeChangedDate, ProbeChangedTime, ProbeChangedStatus, NoOfProbeSlots, NoOfProbes, ProbeID, ProbeSerialNumber, and ActiveExamProbes.

- **Temperature**

  Log entry headings include Time Stamp; Error Level; Package; CPU Internal Temp, TMST Process Temp, TMST Internal Temp, TMST Remote Temp, TX64 Process Temp, TX64 Internal Temp, TX64 Remote Temp, TMST 3.3V, TMST 5V, TMST 12V, TMST 1.2V, TMST 1.5V, TMST 1.8V, TX64 1.5V, TX64 1.8V, TX64 3.3V, TX 64 5V, TX649V, TX64 12V, TX 64 +THV, TX64-THV, TX64+SHV, and TX64-SHV.

- **Probe**

  Log entry headings include Time Stamp; Error Level; Package; Error Message; Severity; Revision; and three new labels that have not yet been named.

- **Board**

  Log entry headings include Time Stamp; Error Level; Package; Board; Severity; Revision and two new labels that have yet been named.

- **DICOM**

  Log entry headings include Time Stamp; Error Level; Package; and Error Message.

### 5-5-4-2 Utilities

The two sub-menus of the **Utilities** category are Plot Log, and Plot Page.

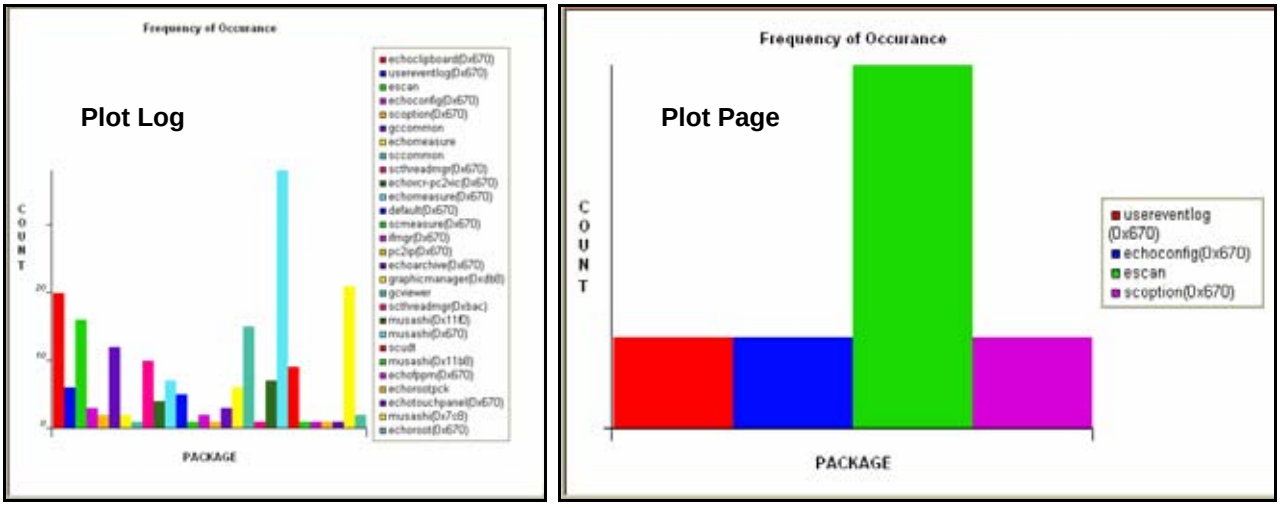


**Figure 5-88 Utilities Sub-Menus**

- **Plot Log**

  Allows for the color coded plot of all Log contents with the package on the ‘x’ axis and incident count on the ‘y’ axis.

- **Plot Page**

  Allows for the color coded plot of all Page contents with the package on the ‘x’ axis and incident count on the ‘y’ axis.

### 5-5-4-3 Search

On the Text Search sub-menu of the **Search** category, users enter case-sensitive text they wish to find. This filter field works well for filtering the Sys log file for the word “fail”.

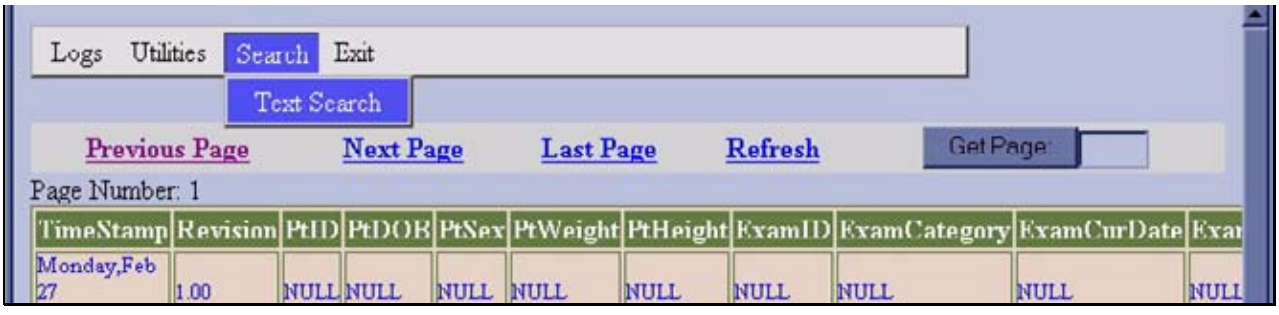


**Figure 5-89 Search Sub-Menu**

### 5-5-4-4 Exit

The sub-menu, **Exit Log Viewer**, returns the user to the Service Desktop home page.

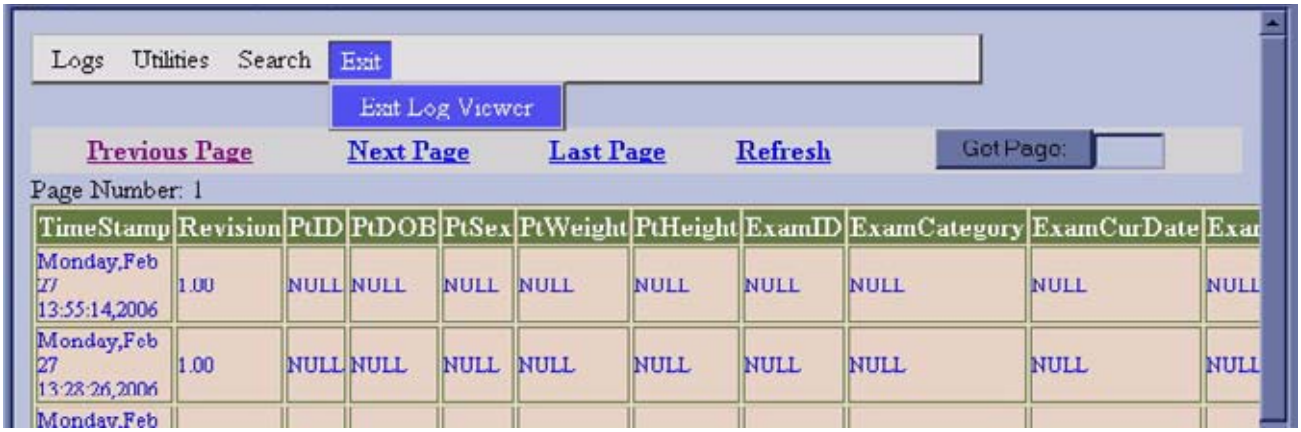


**Figure 5-90 Exit Log Sub-Menu**

## 5-5-5 Diagnostics

Detailed **Diagnostic** information is found in *Chapter 7*.

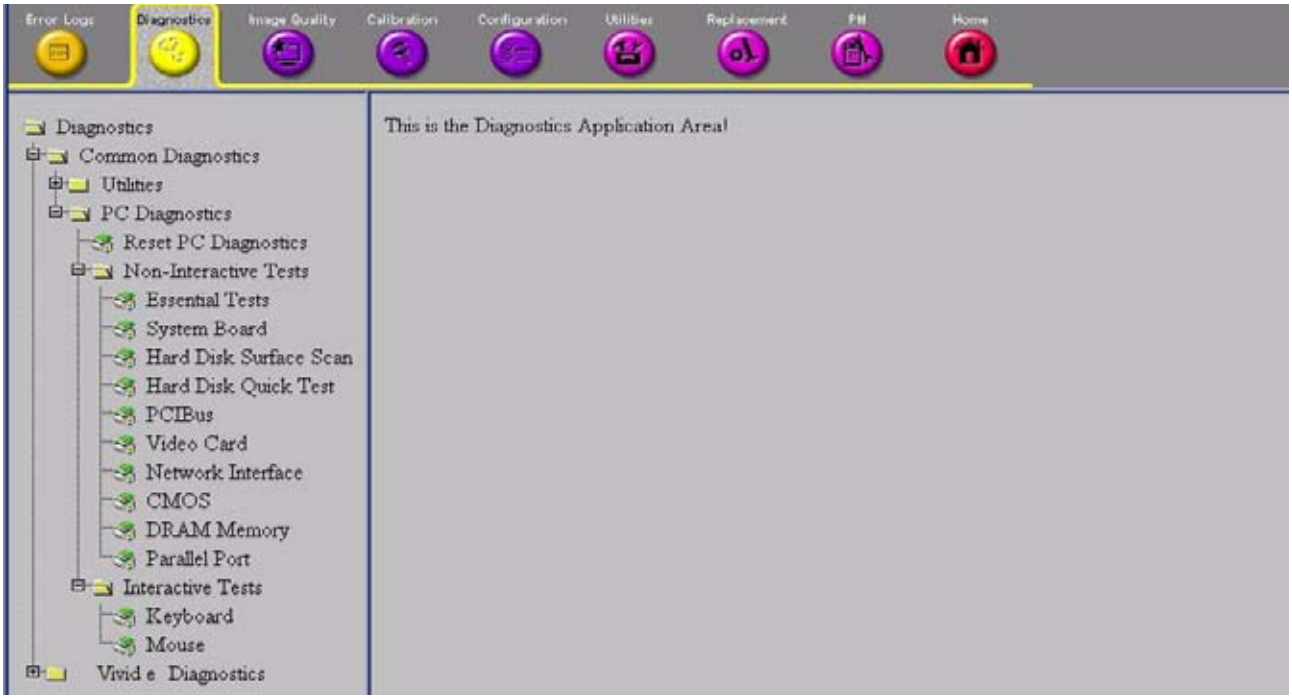


**Figure 5-91 User Diagnostic Page**

### 5-5-5-1 Diagnostics Execution

Diagnostic tests are executable by both local and remote users. The Service Platform provides top-level diagnostic selection based on the user's level and login access permissions. Remote access will require disruptive diagnostic permissions to run Acquisition diagnostics.

### 5-5-5-2 Diagnostic Reports

Diagnostic tests return a report to the Service Platform. The platform retains the report and allows for future viewing of the diagnostic logs.

## 5-5-6 Image Quality

The **Image Quality** page is intended to contain tools for troubleshooting image quality issues.

**Figure 5-92 Image Quality Page**

## 5-5-7 Calibration

The **Calibration** page is intended to contain the tools used to calibrate the system.

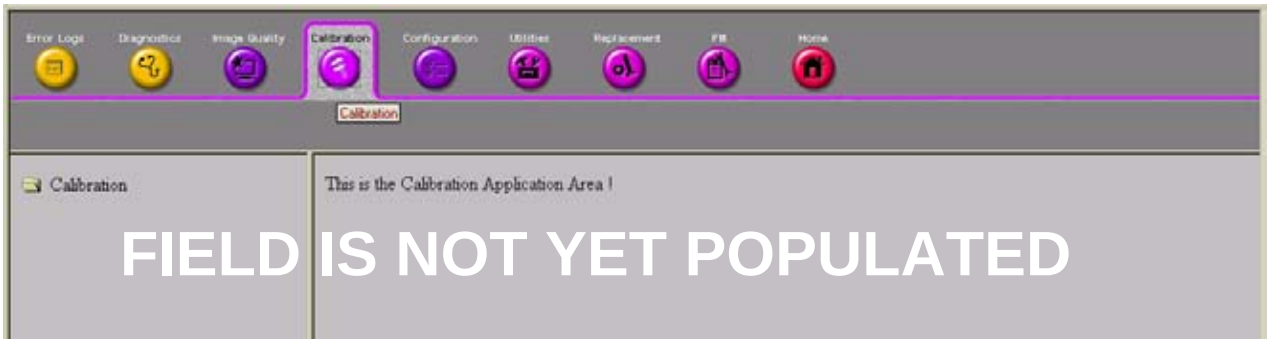


**Figure 5-93 Calibration Page**

## 5-5-8 Configuration

The **Configuration** page is intended to be used to setup various configuration files on the system.

The Service Platform is the access and authorization control for remote access to the configuration subsystem.

The enable/disable of software options can be done from this Configuration page.

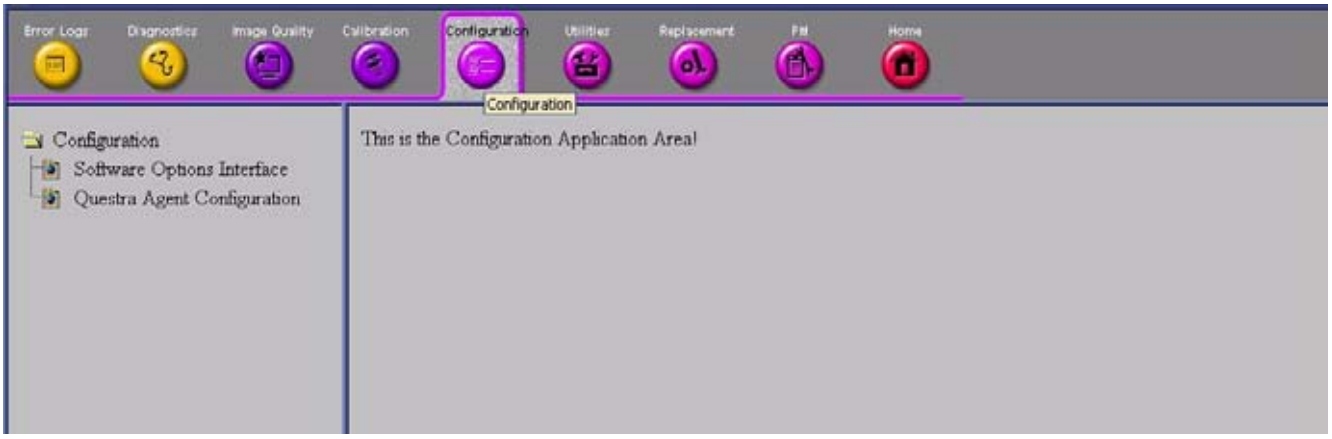


**Figure 5-94 Configuration Page**

## 5-5-9 Utilities

The **Utilities** page contains several miscellaneous tools.

## 5-5-10 Replacement

The **Replacement** page is intended to contain the tools used to track replacement parts used in the system.

**Figure 5-95 Part Replacement Page**

## 5-5-11 PM

The **PM** page is intended to contain the tools used in periodic maintenance of the system.

**Figure 5-96 Planned Maintenance Page**

# Chapter 6
# Service Adjustments

## Section 6-1
## Overview

### 6-1-1 Purpose of this chapter 6

This section describes how to test and adjust the scanner. These tests are optional. You may use them to check the system for errors.

**Table 6-42 Contents in chapter**


| Section | Description | Page Number |
|---|---|---|
| 6-1 | Overview | 6-1 |
| 6-2 | Monitor Adjustments | 6-2 |

# Section 6-2
# Monitor Adjustments

## 6-2-1 Adjustments Procedures

To adjust the brightness and volume:

1.) Press Ctrl + brightness key together (up/down), located on the keyboard.
2.) Press Ctrl + volume key together (left/right), located on the keyboard.

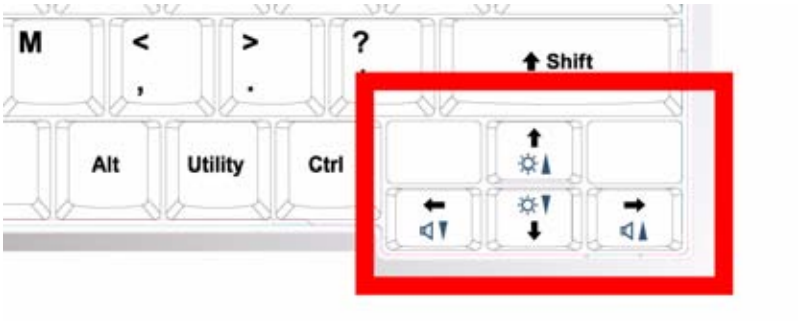


**Figure 6-97 LCD Monitor**

# Chapter 7
# Diagnostics/Troubleshooting

## Section 7-1
## Overview

### 7-1-1 Purpose of Chapter 7

This section describes how to setup and run the tools and software that help maintain image quality and system operation. Very basic host, system and board level diagnostics are run whenever power is applied. Some Service Tools may be run at the application level. However most software tests are required.

**Table 7-43 Contents in Chapter 7**


| Section | Description | Page Number |
|---|---|---|
| 7-1 | Overview | 7-1 |
| 7-2 | Gathering Trouble Data | 7-2 |
| 7-3 | USB Quick Save | 7-4 |
| 7-4 | Screen Captures | 7-6 |
| 7-5 | Global Service User Interface (GSUI) | 7-9 |
| 7-6 | Common Diagnostics | 7-12 |
| 7-7 | Network and Insite II Configuration | 7-15 |

# Section 7-2
# Gathering Trouble Data

## 7-2-1 Overview

There may be a time when it would be advantageous to capture trouble images and system data (logs) for acquisition to be sent back to the manufacturer for analysis. There are different options to acquire this data that would give different results.

## 7-2-2 Collect Vital System Information

The following information is necessary in order to properly analyze data or images being reported as a malfunction or being returned to the manufacturer:

- Product Name = Vivid™ e

From the *Utility>System>About* screen:

**Applications Software**

- Software Version
- Software Part Number

**System Image Software**

- Image Revision
- Image Part Number

## 7-2-3 Collect a Trouble Image with Logs

If the system should malfunction, press the Alt-D keys simultaneously. This will collect a screen capture of the image monitor, system presets and the following logs:

- Keyboard Shadow Log
- Error Logs
- Crash Log
- Power Supply
- Temperature

*NOTE: Power Supply and Temperature logs are not currently being updated by the Vivid™ e.*

This Alt-D function is available at all times.

**Figure 7-98 ALT-D Dialog Box**

When Alt-D is pressed, a menu box appears that allows for:

- A place to enter a description of the problem
- A choice to store to a pre-formatted DVD-R, RD (Removable Disk) or to the *Export* directory D: export.

The subsequent file is compressed and time stamped. The screen capture is a bitmap which eliminates the possibility of artifacts from compression.

# Section 7-3
# USB Quick Save

## 7-3-1 Overview

There may be times when the customer or field engineer will want to directly save images into USB memory. This is accomplished by saving individual Cine clips (moving images- avi format) or still images (jpg format) directly to a USB memory disk by pressing a Print Key.

The P2 key is the factory default print key to accomplish the USB Quick Save. However, the default is for the Image Area only or the customer may have customized the P2 Key function.

## 7-3-2 Check and Record the P2 Key Function

Check the function of the Print 2 Key in the event that the customer may have made some customized settings.

1.) Click *Utility* on the keyboard.
2.) Select *Connectivity* from the Utilities Menu.
3.) Select the *Buttons* tab on the Connectivity screen.
4.) In the *Physical Print Buttons* field, select Print2.

The Connectivity/Buttons Screen will be displayed like the one shown in Figure 7-99 on page 7-4 .

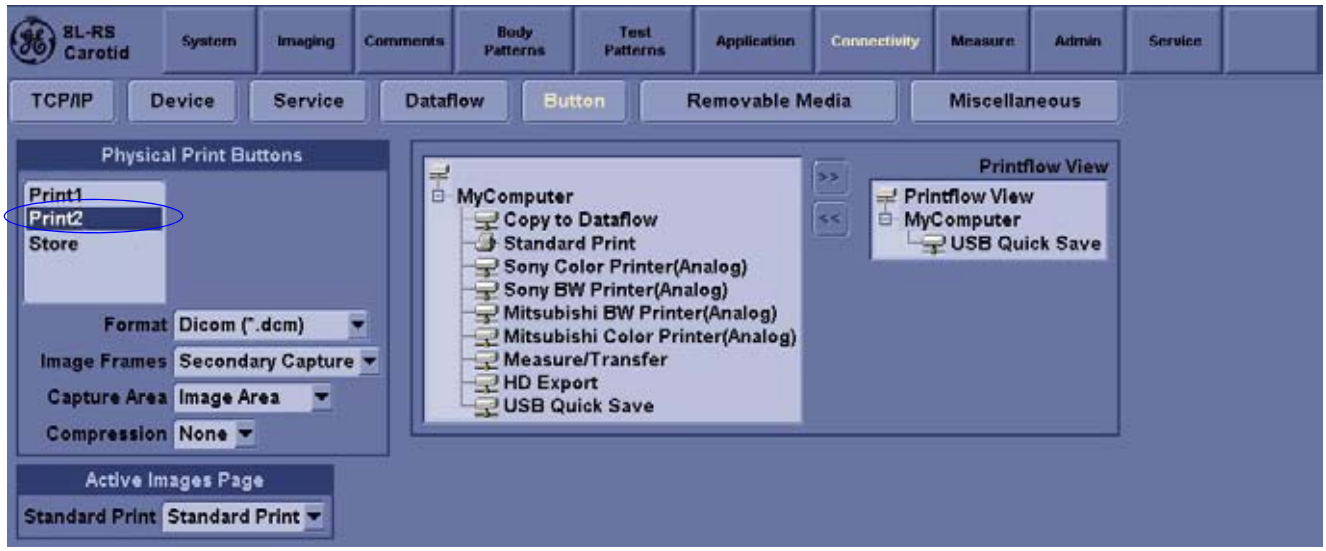


**Figure 7-99 Buttons Set Up Screen**

P2 is the factory default USB Quick Save key. If it is not set to Image Area, proceed to step 5 to record the customer's customized settings.

## 7-3-2 Check and Record the P2 Key Function (cont'd)

5.) In the Destinations section, record the service that is displayed.

6.) In the *Physical Print Buttons* section, record the parameters related to the service.

## 7-3-3 Setting the P2 Key to USB Quick Save

If the P2 Key is not set to USB Quick Save:

1.) While on the Connectivity screen, with the Buttons tab displayed, go to the *Destinations* list.

2.) From the list select *USB Quick Save*. Press [>>] to add the selection to the *Printflow View* section.

3.) Ensure that the *Physical Print Buttons* section for capture Area is set to Image Area and No Image Compression.

4.) The P2 Key should now be set up for USB Quick Save, sending the images directly to the USB memory.

**NOTICE** **It is unable to get full screen using USB Quick Save, just Image Area is available.**

# Section 7-4
# Screen Captures

There may be times when the customer or field engineer will want to capture a presentation on the screen. This is accomplished by first saving the image(s) to the clipboard using a Print Key.

There's no factory default print key to accomplish a secondary screen capture. However, customer may have customize any of Print Key function. Here, take Print2 button for example, Store and Print1 are the same. Therefore, screen capture should involve the following steps:

1.) Check and record any custom settings for the Print2 button.
2.) Set the Print2 button to Whole Screen, Secondary Capture.
3.) Capture the required screens to the Hard Drive or DVD-R.
4.) Restore the Print2 button to it's original settings.

## 7-4-1 Check and Record the P2 Key Function

Check the function of the Print2 Key in the event that the customer may have made some custom settings.

1.) Click *Utilit*y on the keyboard.
2.) Select *Connectivity* from the Utilities Menu.
3.) Select the *Buttons* tab on the Connectivity screen.
4.) In the *Physical Print Buttons* field, select Print2.

The Connectivity/Buttons Screen will be displayed like the one shown in Figure 7-99 on page 7-4 .

If P2 is not set to Whole Screen, as shown in Figure 7-99, proceed to step 5 to record the customer's customized settings.

5.) In the Destinations section, record the service that is displayed.
6.) In the *Physical Print Buttons* section, record the parameters related to the service.

## 7-4-2 Setting the P2 Key to Screen Capture

If the P2 Key is not set to screen capture:

1.) While on the Connect screen, with the Buttons tab displayed, go to the *Destinations* list.
2.) From the list select *Copy To Dataflow*. Press [>>] to add the selection to the *Printflow View* section.
3.) Ensure that the *Physical Print Buttons* section for capture Area is set to Whole Screen, secondary Capture and No Image Compression.
4.) The P2 Key should now be set up for whole screen capture, sending the screens to the image buffer (clipboard).

## 7-4-3 Capturing a Screen

The following is a generic process to capture any screen from the scanner:

1.) Navigate to and display the image/screen to be captured.
2.) Press **P2**. This will place a snapshot of the screen on the "clipboard" displayed at the bottom of the scan image display.

## 7-4-3 Capturing a Screen (cont'd)

**Figure 7-100 Select Image to Capture**

3.) Click FREEZE to unfreeze the image to view the image screen and the snapshots displayed on the bottom.

4.) Highlight the snapshot to be stored to RD (Removable Disk) or DVD-R.

5.) Select Menu on the right side of the image screen, then highlight and select SAVE AS.

**Figure 7-101 Menu > Save As**

## 7-4-3 Capturing a Screen (cont'd)

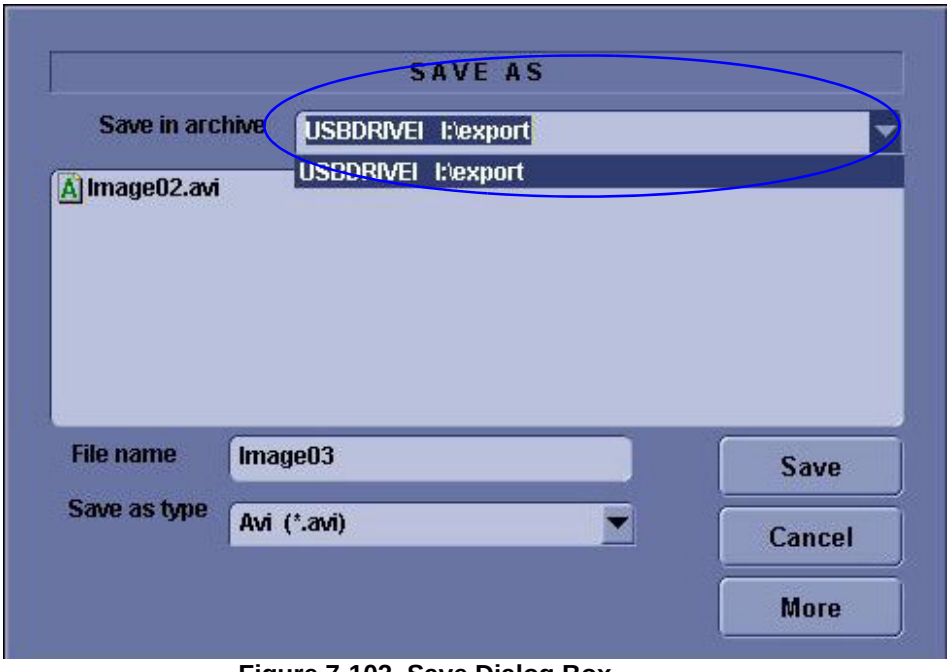


**Figure 7-102 Save Dialog Box**

6.) A Save dialog box will be opened. Choose *d:**export folder* as the archive location to save the image on the hard disk or DVD-R.

⚠ **NOTICE** **After capture the snapshot of the screen to the "clipboard" and save it to the hard disk or other media, it is not full screen image on the hard disk or media.**

## 7-4-4 Reset the P2 Key to Customer's Functionality

If the customer had programmed the P2 Key to a function other than screen capture, restore that functionality recorded in section 7-4-1 on page 6. Refer to Figure 7-99.

1.) Click *Utility* on the keyboard.
2.) Select *Connectivity* from the Utilities Menu.
3.) Select the *Buttons* tab on the Connectivity screen.
4.) In the *Physical Print Button* field, select Print2.
5.) In the *Destinations* list, select the service(s) recorded in step 5, Section 7-4-1.
6.) In the *Physical Print Buttons* section, select the parameters related to the service recorded in step 6, Section 7-4-1.

# Section 7-5
# Global Service User Interface (GSUI)

## 7-5-1 Enter global service user interface

1.) Press Utility - Service, see Figure 7-103 on page 7-9 .

**Figure 7-103 system Service button**

2.) Select GE Service in option of User Level of GEMS Service Home page and input correct password, press OK button. See Figure 7-104 on page 7-9 .

**Figure 7-104 Service Login Page**

## 7-5-2 Active Diagnostic Function

3.) Choose Diagnostic in Global Service Interface to active diagnostic functions, choose options to activate various functions correspondingly.

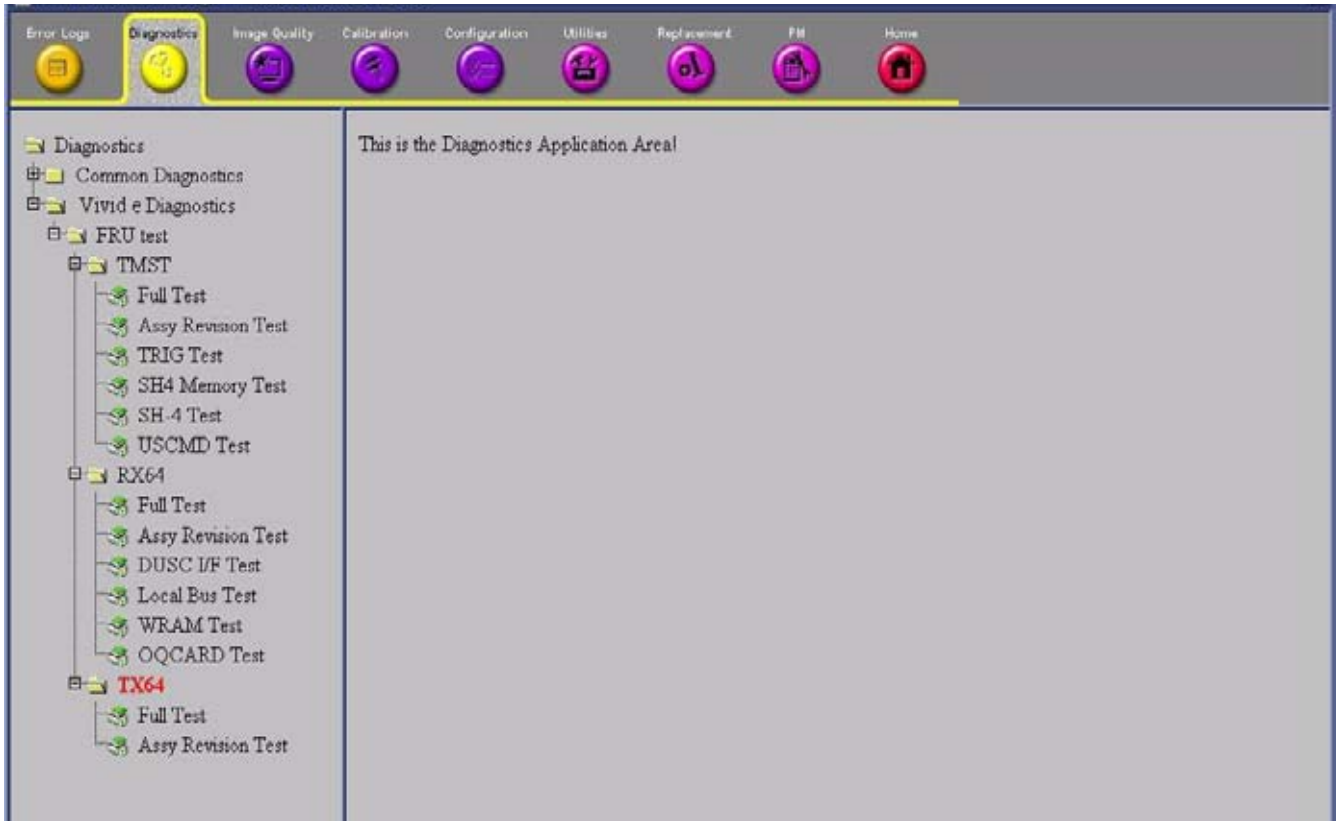


**Figure 7-105 Active Diagnostic Function**

## 7-5-3 Control Frame

Contains the user interface elements used for:

- Diagnostic control, and
- Operator feedback

### 7-5-3-1 Button

This button has two modes each with appropriate text:

- Execute - to start the diagnostic, and
- Abort - to stop a diagnostic

The button can also be disabled.

### 7-5-3-2 Loop Count

This is an editable text field that will only accept numeric values with 4 digits or less. When the button is configured as an “execute” button and pressed, the loop count field will be queried to determine the number of times to execute the diagnostic.

### 7-5-3-3 Progress Indicator

Displays a graphical progress indication to the user.

### 7-5-3-4 Short Text Message

Displays either a starting message or aborting message, as well as the diagnostic completion status.

### 7-5-3-5 Background Color

Initially gray, the Control Frame background color changes upon completion of a diagnostic to indicate completion status.

- Fail = Red
- Pass = Green
- Neither pass nor fail = Set back to Gray (for example, final code status is Aborted).

# Section 7-6
# Common Diagnostics

## 7-6-1 Utilities

Provides two selections:

### 7-6-1-1 Disruptive Mode

Allows you to enable or disable disruptive mode troubleshooting.

### 7-6-1-2 System Shutdown

Allows for system shutdown from the diagnostic menu. Select to *Restart System* or *Shutdown System.* Also, select to retain Disruptive Mode or Not.

After submitting to restart or shutdown a confirmation screen gives one last chance to confirm or cancel the request.

## 7-6-2 PC Diagnostics (Non-Interactive Tests)

### 7-6-2-1 Essential Tests

### 7-6-2-2 System Board

### 7-6-2-3 Hard Disk Surface Scan

### 7-6-2-4 Hard Disk Quick Test

### 7-6-2-5 PCIBus

### 7-6-2-6 Video Card

### 7-6-2-7 Network Interface

### 7-6-2-8 CMOS

### 7-6-2-9 DRAM Memory

### 7-6-2-10 Parallel Port

## 7-6-3 PC Diagnostics (Interactive Tests)

### 7-6-3-1 Keyboard Test

### 7-6-3-2 Mouse Test

## 7-6-4 Restart Vivid™ e After Diagnostics

Always shutdown the system and reboot after a diagnostics session.

# Section 7-7
# Network and Insite II Configuration

## 7-7-1 Network Configuration

### 7-7-1-1 Wire-LAN Network

1.) Connect system with network.

2.) Press Utility -> Connectivity -> TCPIP, in IP Settings window check the Enable DHCP box. In Network Speed box, choose the proper speed available.

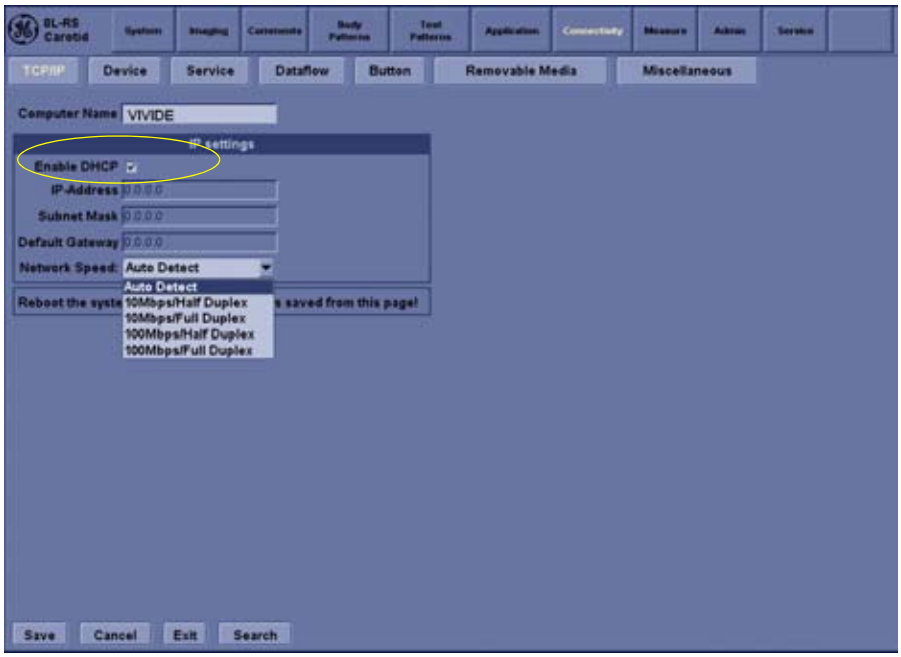


**Figure 7-106 Enable DHCP**

**7-7-1-1 Wire-LAN Network** (cont'd)

*NOTE: If user want to setup static IP address, uncheck Enable DHCP option, input static address in IP-Address box, Subnet Mask and Default Gateway box.* In Network Speed box, choose the proper speed available.

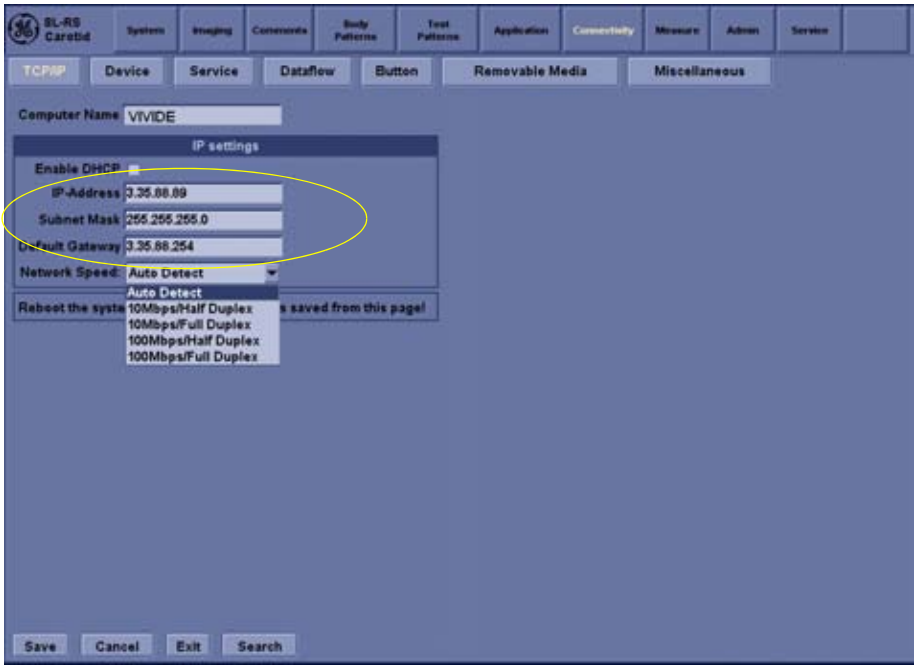


**Figure 7-107 Input static address**

3.) Click Save, in popped-up dialog choose Ok.

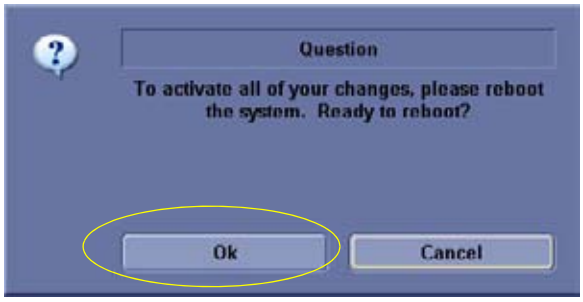


**Figure 7-108 Save and reboot inquiry dialog**

4.) After reboot, the network icon at the left bottom of screen turns green.

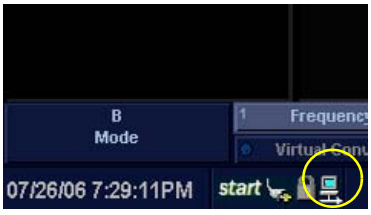


**Figure 7-109 Network icon**

### 7-7-1-2 Wireless LAN Network

1.) Connect wireless LAN card with system.

2.) Click Start at the left bottom of screen, and select "Network Connections.

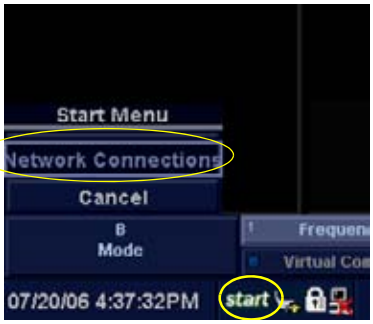


**Figure 7-110 Start menu**

3.) In the pop-up window choose Wireless Network Connection. Click it with cursor key, then select View Available Wireless Networks.

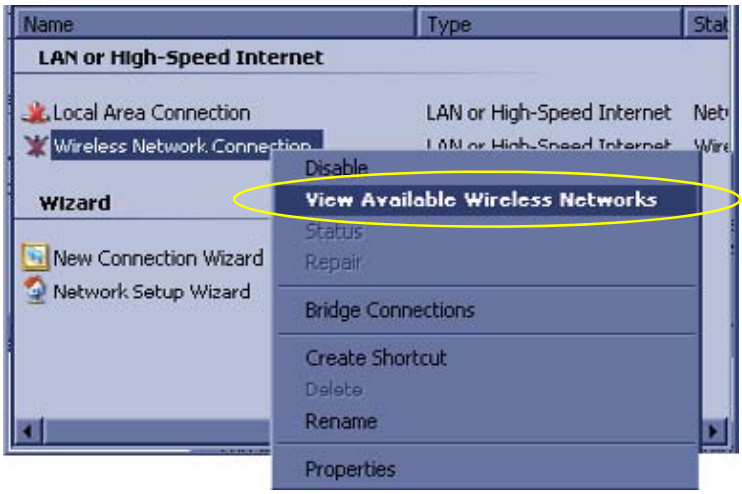


**Figure 7-111 Wireless Network Connection configuration**

**7-7-1-2 Wireless LAN Network** (cont'd)

4.) The Wireless Network Connection dialog box displays. Select the proper wireless network in Available wireless networks window, check the Allow me to connect... box, and click Connect.

Wireless Network Connection
The following wireless network(s) are available. To access a wireless network, select it from the list, and then click Connect.
Available wireless networks:
GEHCWXAP1_4
GEHCWXAP1_1
Wireless Network
This wireless network is not secure. Because a network key (WEP) is not used for authentication or for data encryption, data sent over this network might be subject to unauthorized access.
Allow me to connect to the selected wireless network, even though it is not secure
If you are having difficulty connecting to a network, click Advanced.
Advanced...
Connect
Cancel

**Figure 7-112 Wireless Network Connection dialog box**

*NOTE: If an encrypted network has been selected, input Network key in Wireless Network Connection dialog box displayed, and click Connect.*

Wireless Network Connection
The following wireless network(s) are available. To access a wireless network, select it from the list, and then click Connect.
Available wireless networks:
GEHCWXAP2_2
GEHCWXAP1_1
linksys
This wireless network requires the use of a network key (WEP). To access this network, type the key, then click Connect.
Network key:
Confirm network key:
Enable IEEE 802.1x authentication for this network
If you are having difficulty connecting to a network, click Advanced.
Advanced
Connect
Cancel
Type network key here.

**Figure 7-113 Network key input**

**7-7-1-2 Wireless LAN Network** (cont'd)

5.) The network icon at the left bottom of screen turns green.

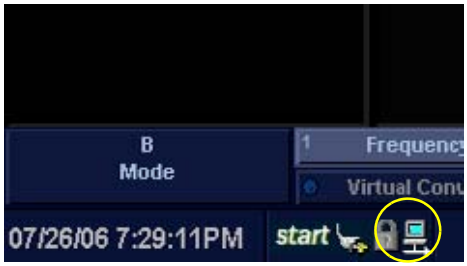


**Figure 7-114 Network icon**

*NOTE: To manually configure a wireless network, the involvement of the IT department is mandatory.*

## 7-7-2 Insite II Configuration

6.) Enter global service user interface, and log in as GE Service. See section 7-5-1 on page 9.

7.) On Configuration page, choose Questra Agent Configuration in left column. Select Advanced Configuration, then choose “Pilot” as server type, and click SAVE.

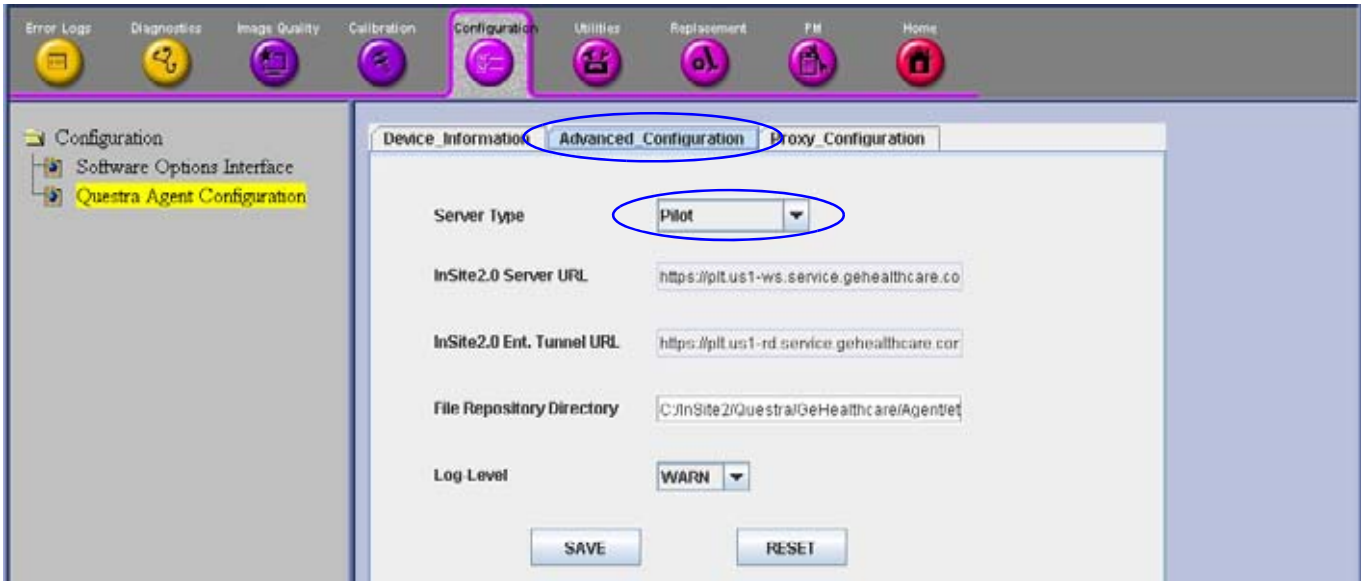


**Figure 7-115 Advanced_Configuration page**

## I7-7-2 Insite II Configuration (cont'd)

8.) Change to Device Information page, enter Device and Serial Number as the serial number of that system, then press Modify Device Configurations.

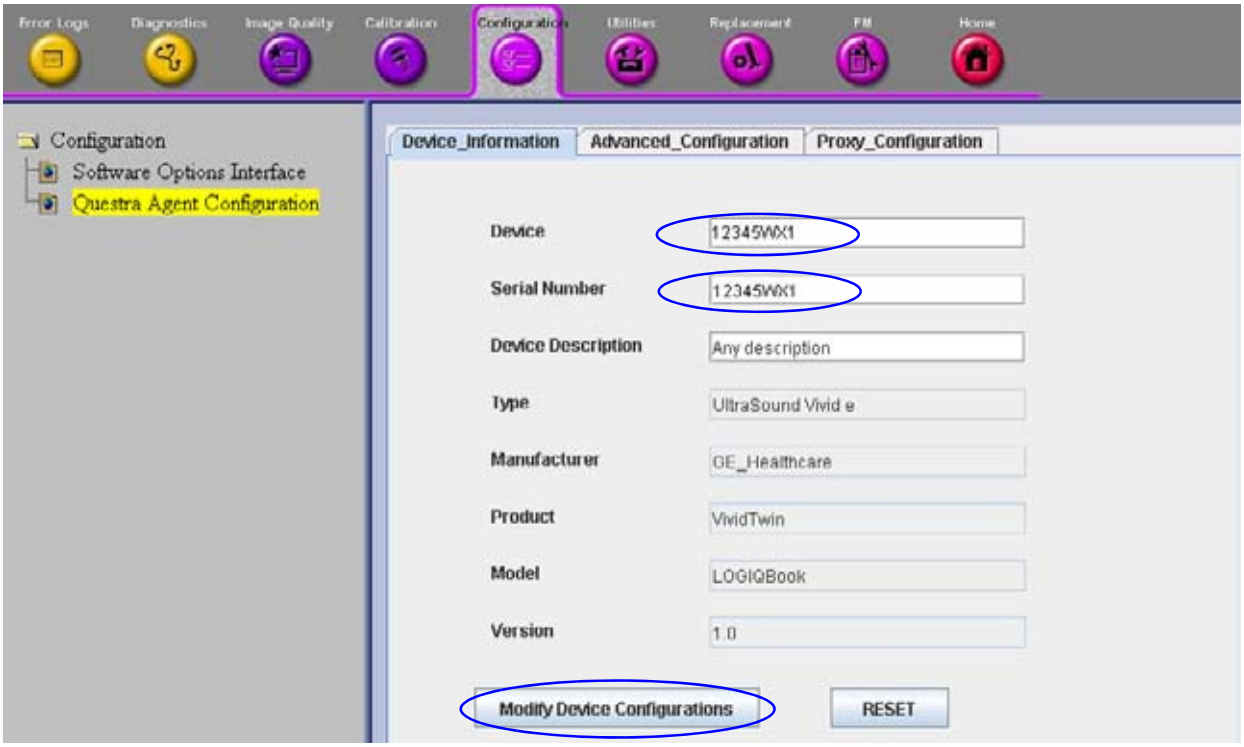


**Figure 7-116 Device_Information page**

*NOTE: The Device name and Serial Number entered should be unique on server. It can be read from the rating plate label.*

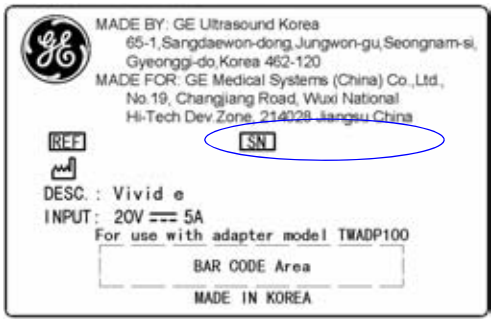


**Figure 7-117 Rating plate label**

## 7-7-2 Insite II Configuration (cont'd)

9.) Change to Proxy_Configuration page, enter Proxy Server Address as 3.20.128.6 and Proxy Server Port as 88, then press SAVE.

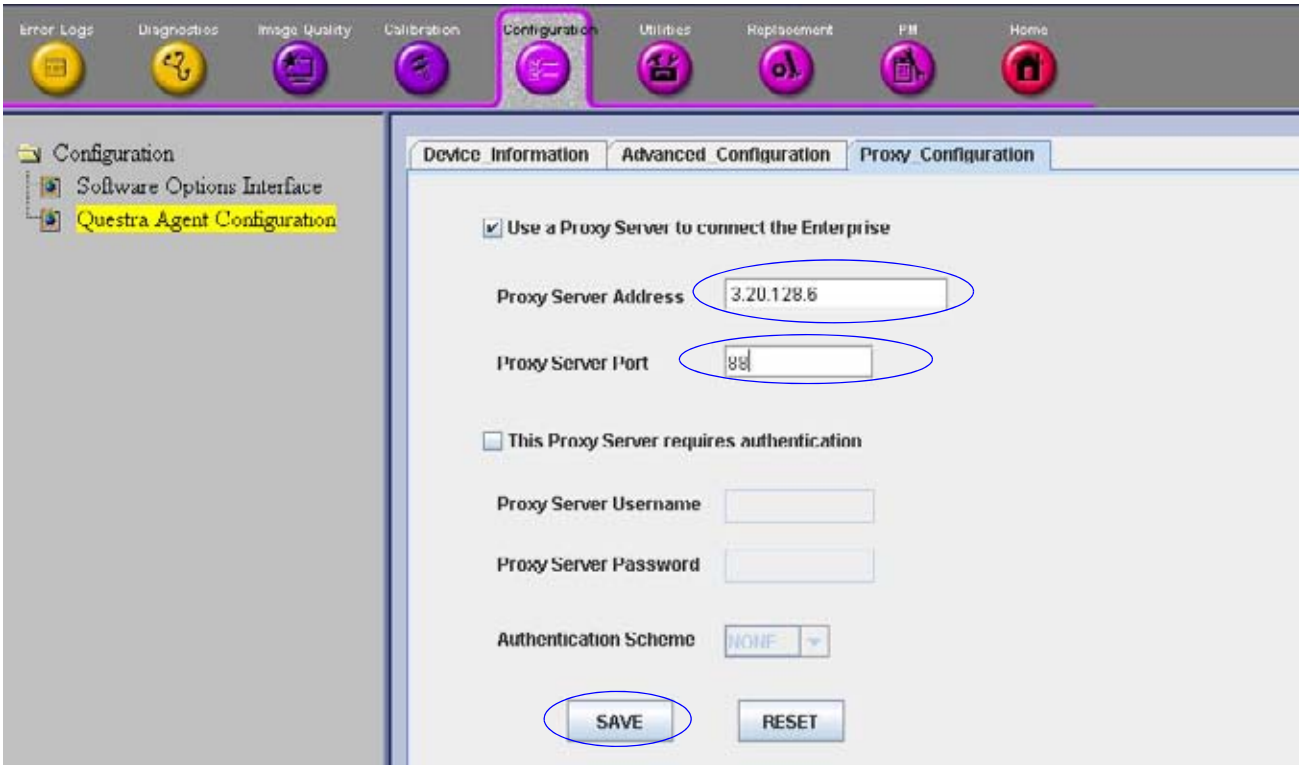


**Figure 7-118 Proxy_Configuration page**

10.) Press power switch, and choose Full Maintenance Reboot to reboot system.

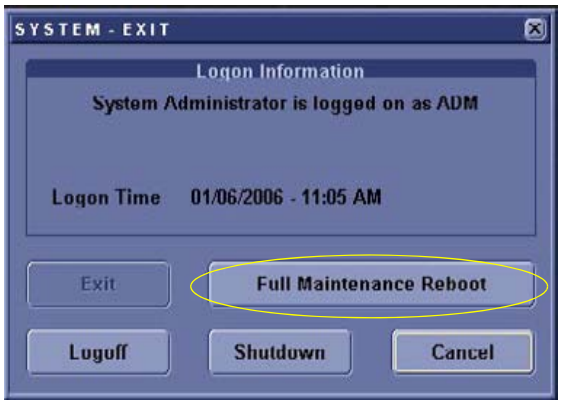


**Figure 7-119 Full Maintenance Reboot window**

# Chapter 8
# Replacement Procedures

## Section 8-1
## Overview

### 8-1-1 Purpose of Chapter 8

This chapter describes replacement procedures for the following modules and subsystems.

**Table 8-1 Contents in Chapter 8**


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| 8-2-16 | Left/Right Fan Assy (FRU No. 310) | 8-35 |
| 8-2-17 | Handle Assy (FRU No. 313) | 8-37 |

# Section 8-2
# Disassembly/Re-assembly

## 8-2-1 Warning and Caution

**WARNING** ***ONLY QUALIFIED SERVICE PERSONNEL SHOULD REMOVE ANY COVERS OR PANELS. ELECTRICAL HAZARDS EXISTS AT SEVERAL POINTS INSIDE. BECOME THOROUGHLY FAMILIAR WITH ALL HAZARDOUS VOLTAGES AND HIGH CURRENT LEVELS TO AVOID ACCIDENTAL CONTACT***

**CAUTION** **Do not wear the ESD wrist strap when you remove a part of power supply unit. Turn OFF power and unplug the power cord before removing a part of power supply unit.**

## 8-2-2 Standard tools list for Vivid™ e

**Table 8-2 Standard tools list**

| No | Part Name | Part No. | QTY | Screw Description | Screwdriver Description |
|---|---|---|---|---|---|
| 1 | screw | 5144206 | 2 | Screw GB818 M2x6 (NL) | Phillips #0 |
| 2 | screw | 2327764 | 10 | D2 SCREW M2X3-NYLOK | Phillips #0 |
| 3 | screw | 5144212 | 10 | Screw FH M2X3.5 (NL) | Phillips #0 |
| 4 | screw | 2327785 | 21 | D2 SCREW M2X4,NYLOK | Phillips #0 |
| 5 | screw | 5148762 | 4 | Screw FH M2x8 (NL) | Phillips #0 |
| 6 | screw | 5138463 | 3 | Screw FH M2.5x3 (NL) | Phillips #1 |
| 7 | screw | 5148969 | 4 | Screw SFH M2.5x4 (NL) | Phillips #1 |
| 8 | screw | 5138465 | 49 | Screw FH M2.5x5(NL) | Phillips #1 |
| 9 | screw | 5144213 | 2 | Screw FHE M2.5x5 (NL) | Phillips #1 |
| 10 | screw | 5161078 | 4 | Screw SJ2836-87 M2.5X6(I) | Phillips #1 |
| 11 | screw | 5162744 | 5 | SCREW SJ2836-87 M2.5x12 (II) | Phillips #1 |
| 12 | screw | 2327782 | 6 | D2 SCREW M3X3-NYLOK | Phillips #1 |
| 13 | screw | 5144997 | 8 | Screw FH M3X6 (NL) | Phillips #1 |
| 14 | screw | 2327793 | 33 | D2 SCREW SJ2836-87 M3X8 | Phillips #2 |
| 15 | screw | 5138468 | 4 | Screw BN5687 M3X10(NL) | TORX#10 |
| 16 | screw | 5144998 | 8 | Screw FH M3X13 (NL) | Phillips #1 |
| 17 | screw | 5145001 | 5 | Screw SJ2836-87 M3X18(I) | Phillips #2 |
| 18 | screw | 5162727 | 7 | Screw M3x25(NL) | TORX#10 |

*NOTE: Please use the correct Screwdrivers listed in Table 8-2 on Vivid™ e.*

## 8-2-3 LCD Assy (FRU No. 100)

Purpose: This is a description on how to remove and replace the LCD Assy (FRU No.100).

### 8-2-3-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-3-2 Needed Manpower

- 1 person, 11 minutes + travel

### 8-2-3-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove the battery.

### 8-2-3-4 Removal procedure

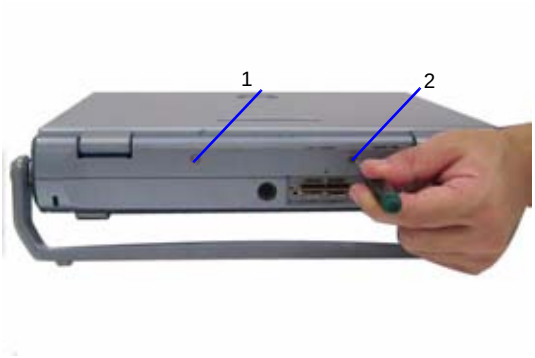
Refer to Figure 8-1 on page 8-4 .

1.) Unscrew 2 screws [Part No: 5138465, see Figure 8-1 on page 8-4 ].
2.) Use a minus screwdriver to prize the first barb of menu panel. Refer to Figure 8-1 on page 8-4 .
3.) Prize the rest barbs one by one from right to left to remove the menu panel. Refer to Figure 8-1 on page 8-4 .
4.) Unscrew three screws(1-3) [Part No: 5138465, see Figure 8-1 on page 8-4 ].
5.) Disconnect one connector, refer to Figure 8-1 on page 8-4 .
6.) Disconnect two connectors, refer to Figure 8-1 on page 8-4 .
7.) Unscrew two screws [Part No: 5138465, see Figure 8-2 on page 8-5 ].
8.) Unscrew four screws [Part No: 2327793, see Figure 8-2 on page 8-5 ].
9.) Unscrew two screws [Part No: 5138468, see Figure 8-2 on page 8-5 ].
10.) Remove LCD Assy(FRU No.100), refer to Figure 8-2 on page 8-5 .

### 8-2-3-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

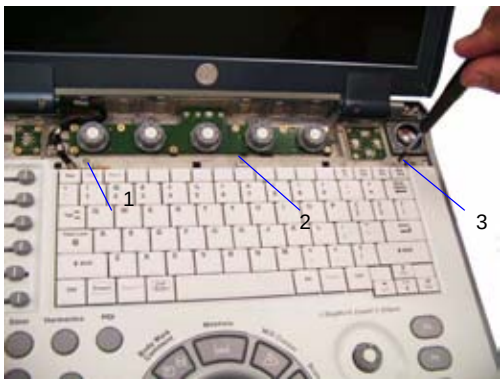
## 8-2-3 LCD Assy (FRU No. 100) (cont'd)




1)

2)

3)



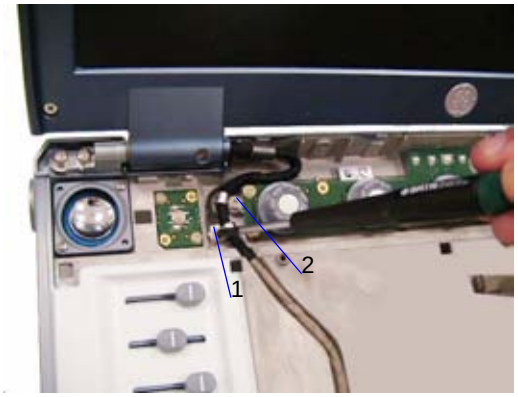

4)

5)

6)

**Figure 8-1 LCD Assy Disassembly**

## 8-2-3 LCD Assy (FRU No. 100) (cont'd)




7)

8)

9)

10)

**Figure 8-2 LCD Assy Disassembly**

## 8-2-4 LCD Cable (FRU No. 105)

Purpose: This is a description on how to remove and replace the LCD Cable (FRU No.105).

### 8-2-4-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-4-2 Needed Manpower

- 1 person, 35 minutes + travel

### 8-2-4-3 Preparations

- Shut Down the System and disconnect the AC/DC power.

### 8-2-4-4 Removal Procedure

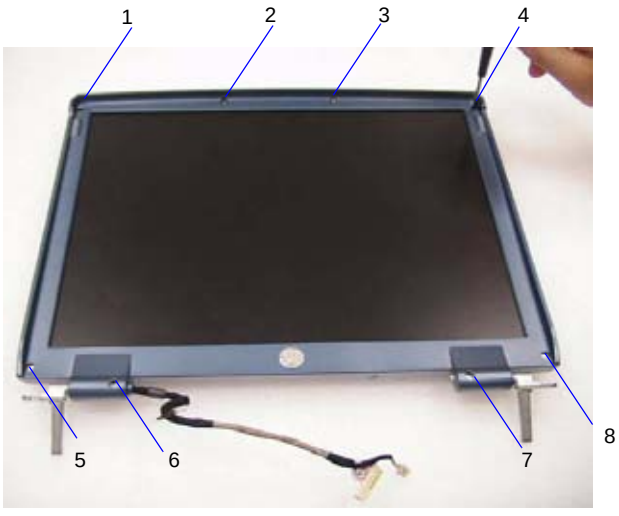
Refer to Figure 8-3 on page 8-7 , Figure 8-4 on page 8-8 .

1.) Remove LCD Assy (FRU No.100), Refer to 8-2-3 "LCD Assy (FRU No. 100)" on page 8-3.
2.) Unscrew eight screws(1-8) [Part No: 5138465, see Figure 8-3 on page 8-7 ].
3.) Remove the LCD front cover.
4.) Unscrew screws(1-2) and screw 3 [Part No: 5144212 and 5138465, see Figure 8-3 on page 8-7 ].
5.) Disconnect two connectors(1-2). Refer to Figure 8-3 on page 8-7
6.) Unscrew six screws(1-6) [Part No: 5138465, see Figure 8-4 on page 8-8 ].
7.) Remove the LCD panel (FRU No.104).
8.) Disconnect one connector. Refer to Figure 8-4 on page 8-8 .
9.) Remove the LCD Cable (FRU No.105).

### 8-2-4-5 Mounting procedure

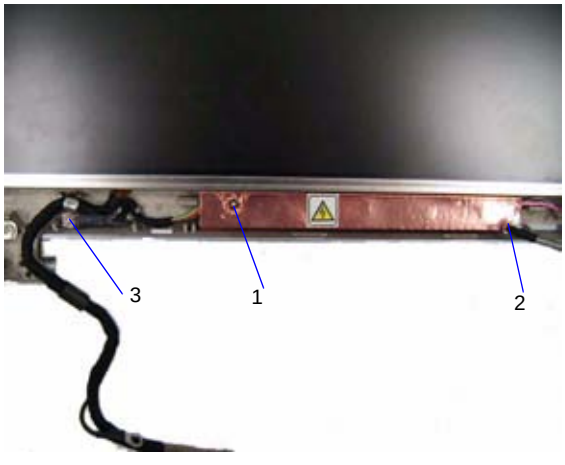
1.) Install the new parts in the reverse order of removal.

## 8-2-4 LCD Cable (FRU No. 105) (cont'd)

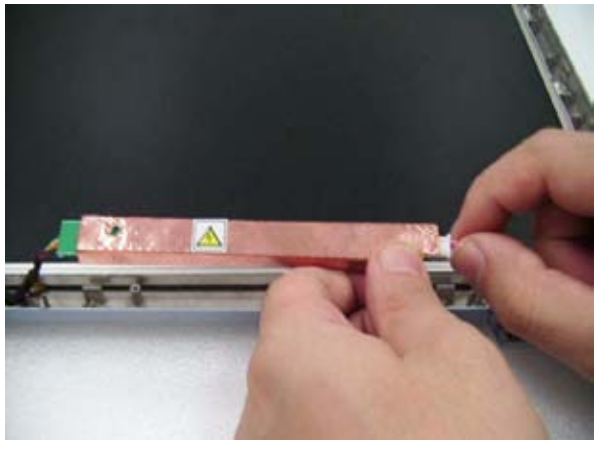



2)

3)




4)



5)

**Figure 8-3 LCD Cable Assy Disassembly**

## 8-2-4 LCD Cable (FRU No. 105) (cont'd)

6)

7)

8)

9)

**Figure 8-4 LCD Cable Assy Disassembly**

## 8-2-5 Keyboard Assy (FRU No. 200)

Purpose: This is a description on how to remove and replace Keyboard Assy (FRU No.200).

### 8-2-5-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-5-2 Needed Manpower

- 1 person, 8 minutes + travel

### 8-2-5-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-5-4 Removal Procedure

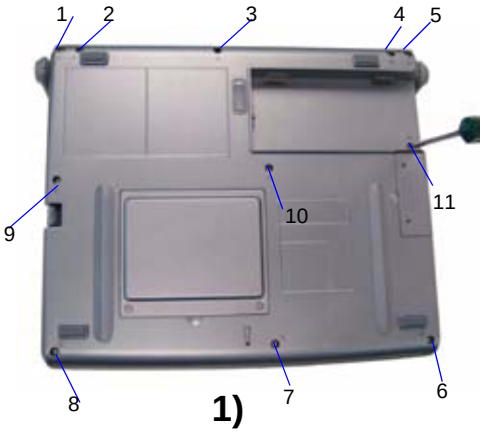
Refer to Figure 8-5 on page 8-10 .

1.) Unscrew 11 screws. Refer to Figure 8-5 on page 8-10 .
2.) Remove the LCD Assy and Keyboard Assy together. Refer to Figure 8-5 on page 8-10 .
3.) Disconnect two connectors. Refer to Figure 8-5 on page 8-10 .
4.) Remove LCD Assy. Refer to step 7 to step 10 in 8-2-3 on page 8-3 .

### 8-2-5-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

## 8-2-5 Keyboard Assy (FRU No. 200) (cont'd))




1)

2)

3)

4)

**Figure 8-5 Keyboard Assy Disassembly**

## 8-2-6 KBD Cover Assy (FRU No. 203)

Purpose: This is a description on how to remove and replace Keyboard Assy (FRU No.203).

### 8-2-6-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-6-2 Needed Manpower

- 1 person, 8 minutes + travel

### 8-2-6-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-6-4 Removal Procedure

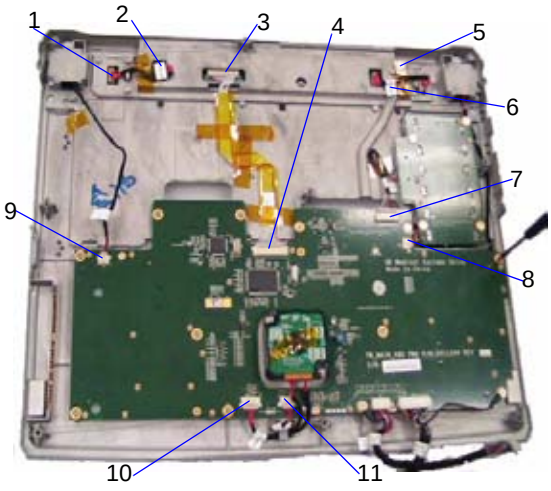
Refer to Figure 8-6 on page 8-12 and Figure 8-7 on page 8-13 .

1.) Remove LCD Assy. Refer to section 8-2-3 on page 3.
2.) Disconnect 11 connectors, see Figure 8-7 on page 8-13 .
3.) Unscrew four screws on the keyboard cover(1-4) [Part No: 5148762, see Figure 8-6 on page 8-12 ] to remove the speakers.
4.) Unscrew three screws [Part No: 5138465, see Figure 8-6 on page 8-12 ] to remove soft-menu PCB.
5.) Unscrew five screws [Part No: 2327785, see Figure 8-6 on page 8-12 ] to remove power PCB and menu-key PCB.
6.) Remove TGC keytop. Refer to Figure 8-6 on page 8-12 .
7.) Unscrew twelve screws(1-12) [Part No: 5138465, see Figure 8-7 on page 8-13 ] to remove keyboard PCB.
8.) Disconnect one connect to remove the keyboard cable. Refer to Figure 8-7 on page 8-13 .
9.) Unscrew four screws [Part No: 5138465, see Figure 8-7 on page 8-13 ] to remove TGC PCB.

### 8-2-6-5 Mounting procedure

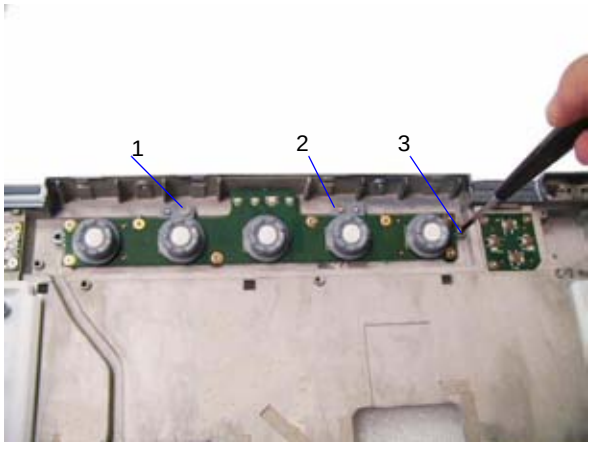
1.) Install the new parts in the reverse order of removal.

## 8-2-6 KBD Cover Assy (FRU No. 203) (cont'd)

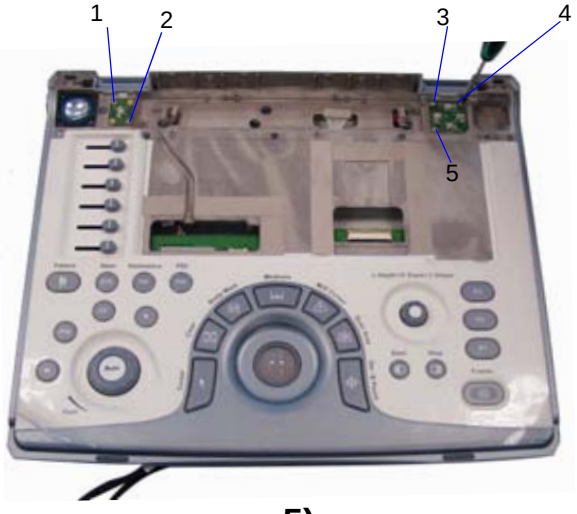



2)

3)




4)

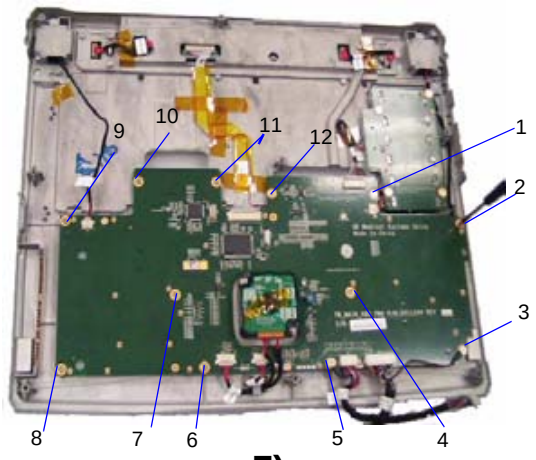



5)

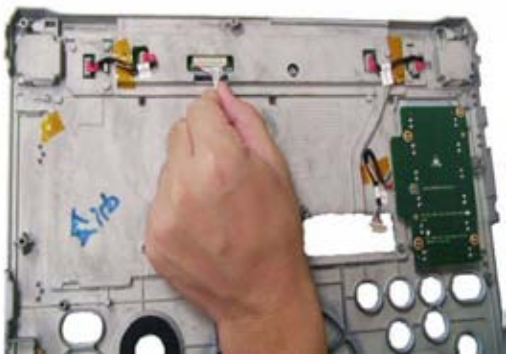
**Figure 8-6 Keyboard Cover Assy Disassembly**

## 8-2-6 KBD Cover Assy (FRU No. 203) (cont'd)

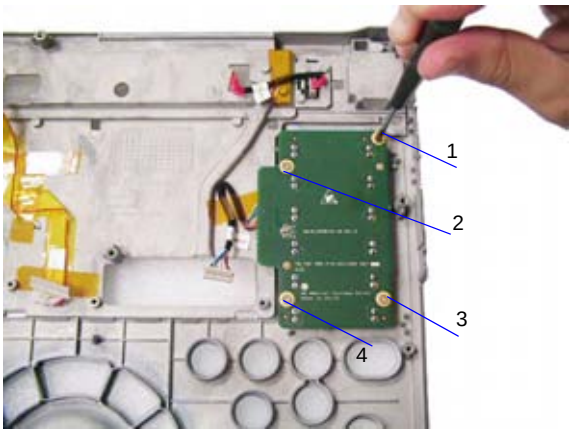
6)




7)



8)




9)

**Figure 8-7 Keyboard Cover Assy Disassembly (cont'd)**

## 8-2-7 Trackball Assy (FRU No. 201)

Purpose: This is a description on how to remove and replace the Trackball Assy (FRU No.201).

### 8-2-7-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-7-2 Needed Manpower

- 1 person, 10 minutes + travel

### 8-2-7-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-7-4 Removal Procedure

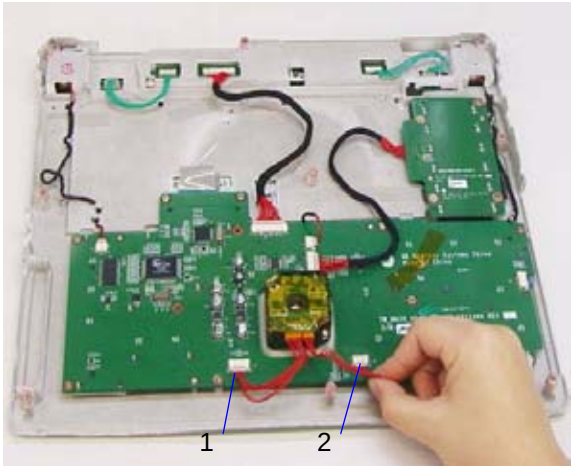
Refer to Figure 8-8 on page 8-15 .

1.) Remove Keyboard Assy (FRU No.200), refer to 8-2-5 "Keyboard Assy (FRU No. 200)" on page 8-9.
2.) Disconnect two connectors. Refer to Figure 8-8 on page 8-15 .
3.) Unscrew two screws(1-2) [Part No: 2327793, see Figure 8-8 on page 8-15 ].
4.) Remove Trackball Assy.

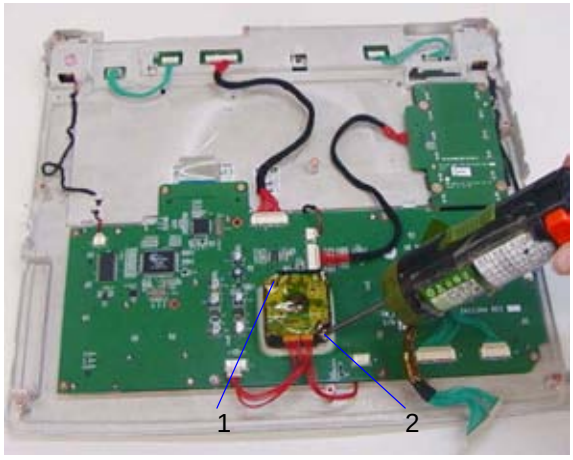
### 8-2-7-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

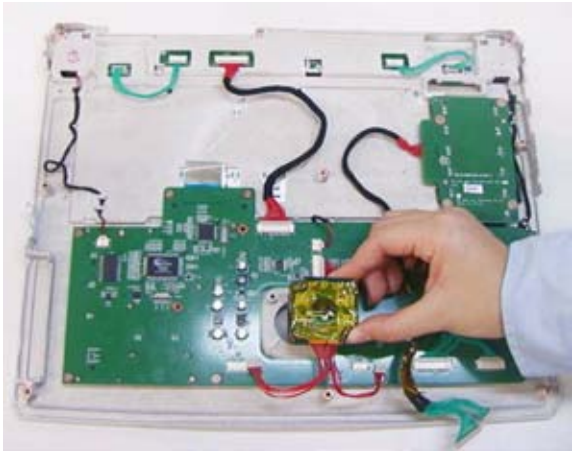
## 8-2-7 Trackball Assy (FRU No. 201) (cont'd)




2)




3)



4)

**Figure 8-8 Trackball Assy Disassembly**

## 8-2-8 TMST Assy (FRU No. 301)

Purpose: This is a description on how to remove and replace the TMST Assy(FRU No.301).

### 8-2-8-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-8-2 Needed Manpower

- 1 person, 15 minutes + travel

### 8-2-8-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-8-4 Removal Procedure

Refer to Figure 8-9 on page 8-17 .

1.) Remove LCD Assy and Keyboard Assy together, refer to step 1 to step 4 in 8-2-5 "Keyboard Assy (FRU No. 200)" on page 8-9.
2.) Remove Harddisk Assy (FRU No.316), refer to 8-2-14 "Harddisk Assy (FRU No. 316)" on page 8-31.
3.) Remove four screws on TMST2TX board (1-4),[Part No:2327785, see Figure 8-9 on page 8-17 ].
4.) Remove TMST2TX board, see Figure 8-9 on page 8-17 .
5.) Disconnect two connectors.
6.) Unscrew six screws(1-6)[Part No: 2327793, see Figure 8-9 on page 8-17 ].
7.) Remove TMST Assy(FRU No.301).

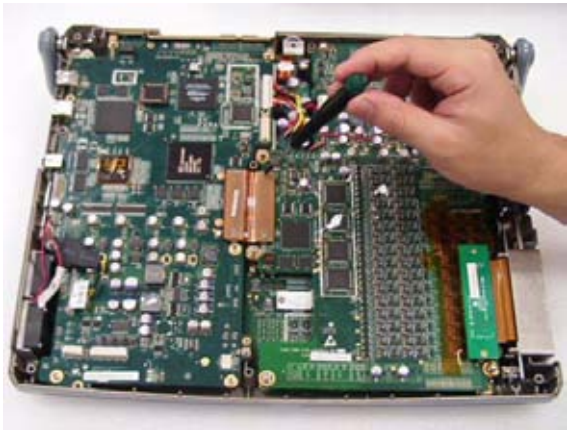
### 8-2-8-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

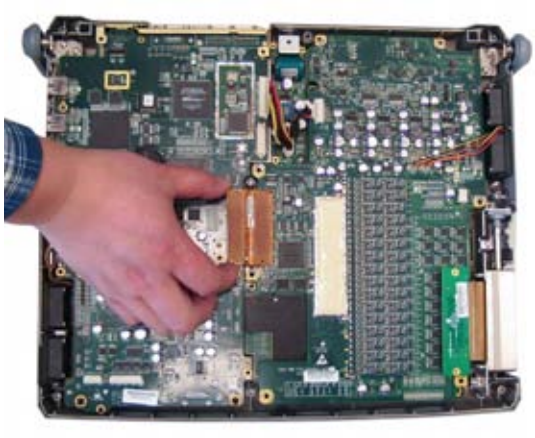
### 8-2-8-6 Test Points

Without power supply, test impedance between each power testing point and DGND by the digital multimeter, see Figure 8-10 on page 8-18 and Table 8-3 on page 8-18 .

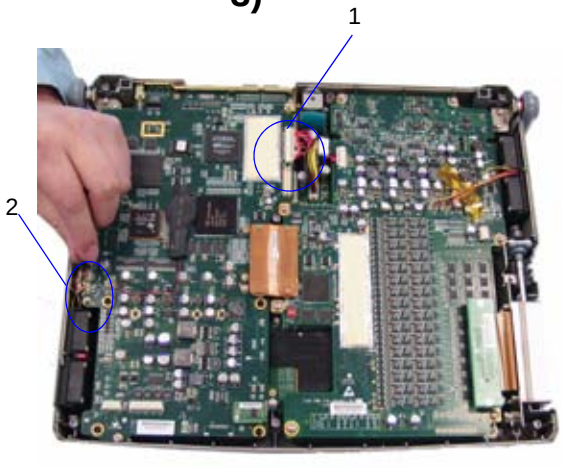
## 8-2-8 TMST Assy (FRU No. 301) (cont'd)



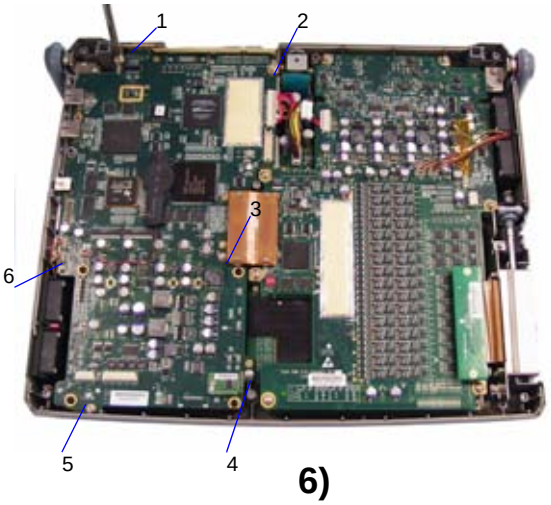
3)



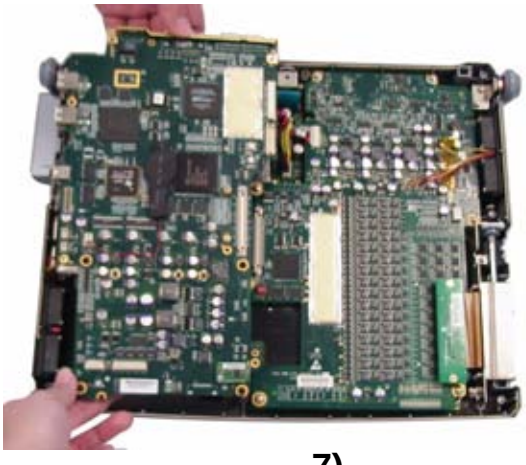
4)




5)




6)



7)

**Figure 8-9 TMST Assy Disassembly**

## 8-2-8 TMST Assy (FRU No. 301) (cont'd)

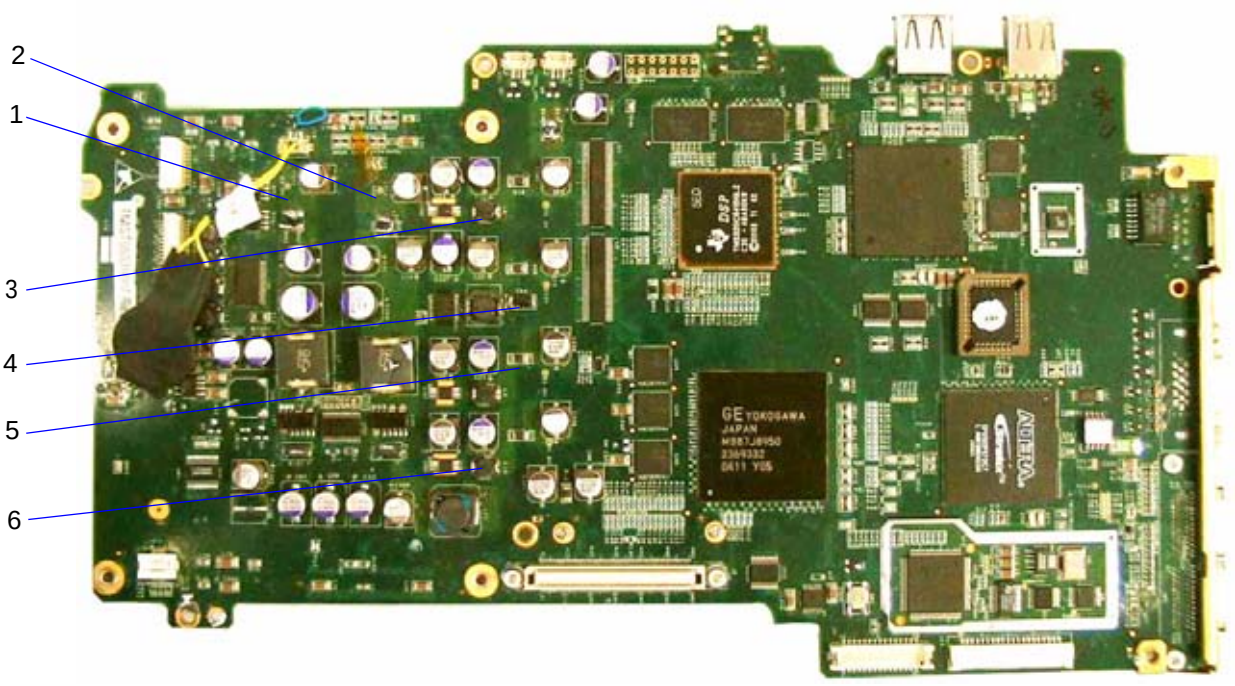



**Figure 8-10 Test points on TMST board**

**Table 8-3 Test points values on TMST board**

| Item | Value | Item | Value |
|---|---|---|---|
| 1 | D3.3V | 2 | D5V |
| 3 | D1.2V | 4 | D12V |
| 5 | D1.5V | 6 | D1.8V |

## 8-2-9 TX64 Assy (FRU No.302)

Purpose: This is a description on how to remove and replace the TX64 Assy(FRU No.302).

### 8-2-9-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-9-2 Needed Manpower

- 1 person, 16 minutes + travel

### 8-2-9-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-9-4 Removal Procedure

Refer to Figure 8-11 on page 8-20 .

1.) Remove LCD Assy and Keyboard Assy together, refer to step 1 to step 4 in 8-2-5 "Keyboard Assy (FRU No. 200)" on page 8-9.
2.) Unscrew two screws [Part No: 2327785, see Figure 8-11 on page 8-20 ].
3.) Disconnect probe connector, see Figure 8-11 on page 8-20 .
4.) Remove four screws on TMST2TX board (1-4),[Part No:2327785, see Figure 8-9 on page 8-17 ].
5.) Remove TMST2TX board, see Figure 8-9 on page 8-17 .
6.) Disconnect two connectors, refer to Figure 8-11 on page 8-20 .
7.) Unscrew seven screws, screw 2, 3 [Part No: 2327793, see Figure 8-11 on page 8-20 ], screw 1, 4, 5, 6, 7 [Part No: 5145001, see Figure 8-11 on page 8-20 ].
8.) Remove TX64 Assy (FRU No.302). See Figure 8-11 on page 8-20 .

### 8-2-9-5 Mounting procedure

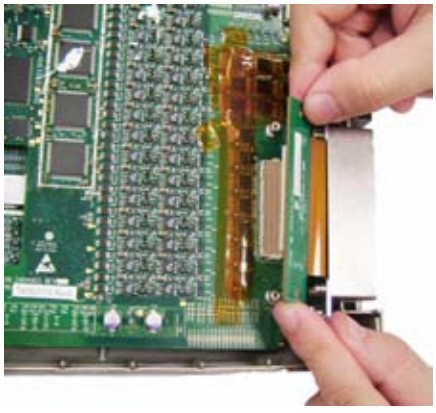
1.) Install the new parts in the reverse order of removal.

### 8-2-9-6 Test points

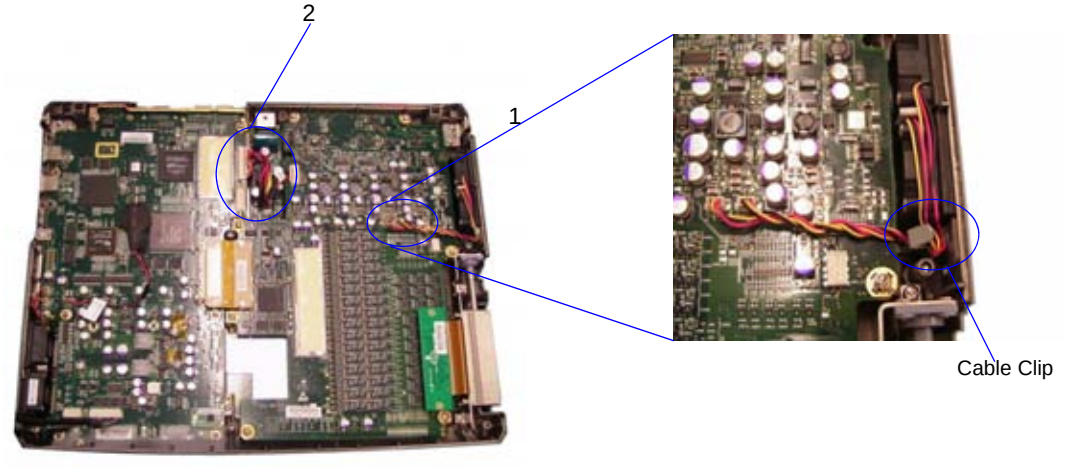
Without power supply, test impedance between each power testing point and DGND by the digital multimeter, see Figure 8-12 on page 8-21 and Table 8-4 on page 8-21 .

## 8-2-9 TX64 Assy (FRU No.302) (cont'd)

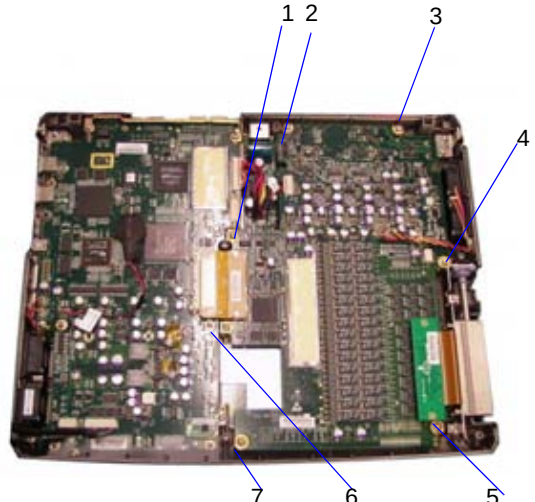
2)



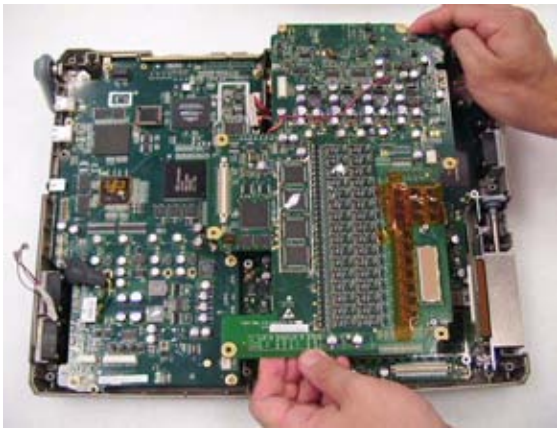
3)




6)




7)



8)

**Figure 8-11 TX64 Assy Disassembly**

## 8-2-9 TX64 Assy (FRU No.302) (cont'd)

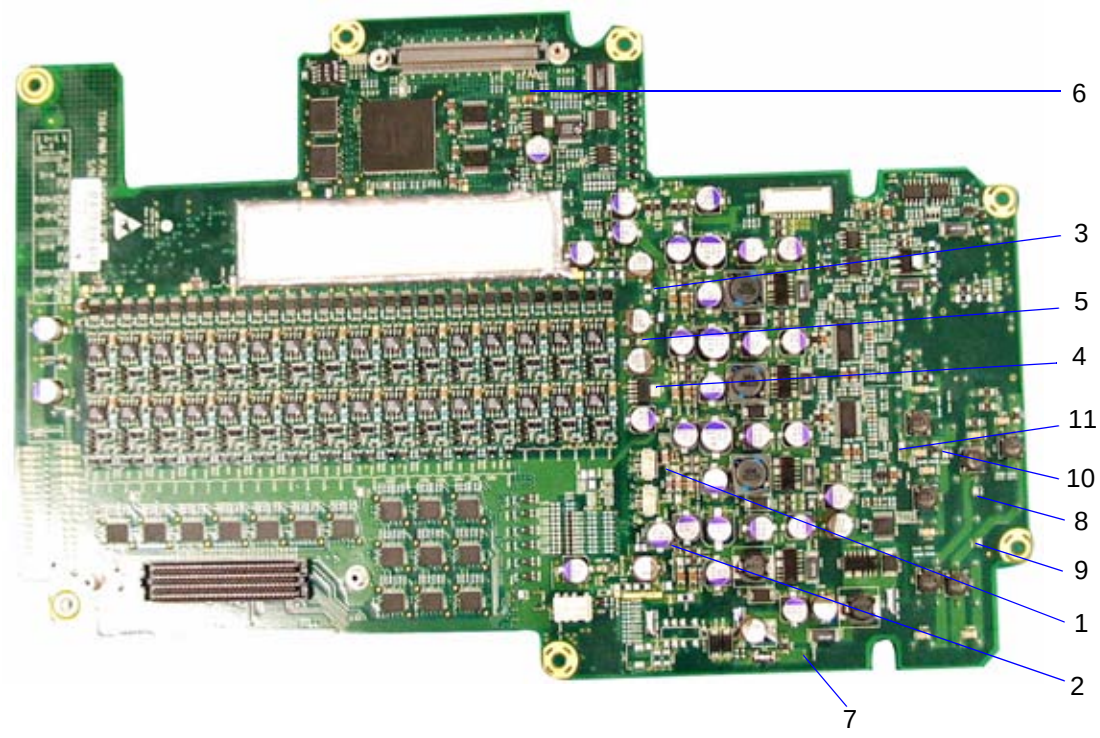



**Figure 8-12 Test points on TX64 board**

**Table 8-4 Test points values on TX64 board**

| Item | Value | Item | Value | Item | Value |
|---|---|---|---|---|---|
| 1 | 5V | 2 | 9V | 3 | 3.3V |
| 4 | A3.5V | 5 | 7V | 6 | D1.5V |
| 7 | CWTHV | 8 | +THV | 9 | -THV |
| 10 | +SHV | 11 | -SHV | | |

## 8-2-10 RX64 Assy (FRU No. 303)

Purpose: This is a description on how to remove and replace the RX64 Assy(FRU No.303).

### 8-2-10-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-10-2 Needed Manpower

- 1 person, 10 minutes + travel

### 8-2-10-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-10-4 Removal Procedure

Refer to Figure 8-13 on page 8-22 .

1.) Remove TX64 Assy (FRU No. 302), refer to 8-2-9 "TX64 Assy (FRU No.302)" on page 8-19.
2.) Unscrew four screws [Part No: 2327793, see Figure 8-13 on page 8-22 ].
3.) Remove RX64 Assy.(FRU No.303). See Figure 8-13 on page 8-22 .

### 8-2-10-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

### 8-2-10-6 Test points

Without power supply, test impedance between each power testing point and DGND by the digital multimeter, see Figure 8-14 on page 8-23 and Table 8-5 on page 8-23 .

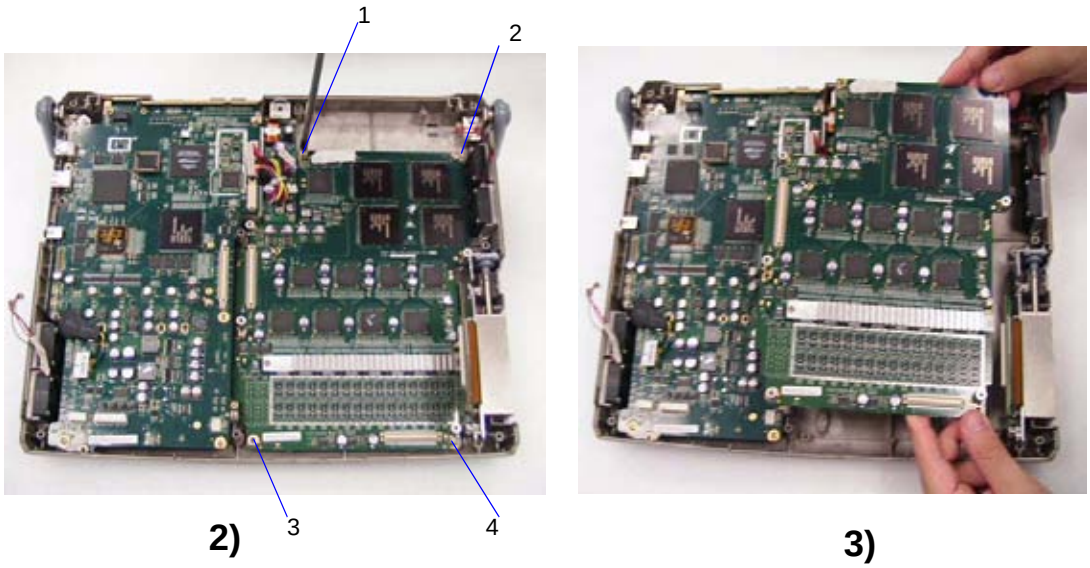



**Figure 8-13 RX64 Assy Disassembly**

## 8-2-10 RX64 Assy (FRU No. 303) (cont'd)

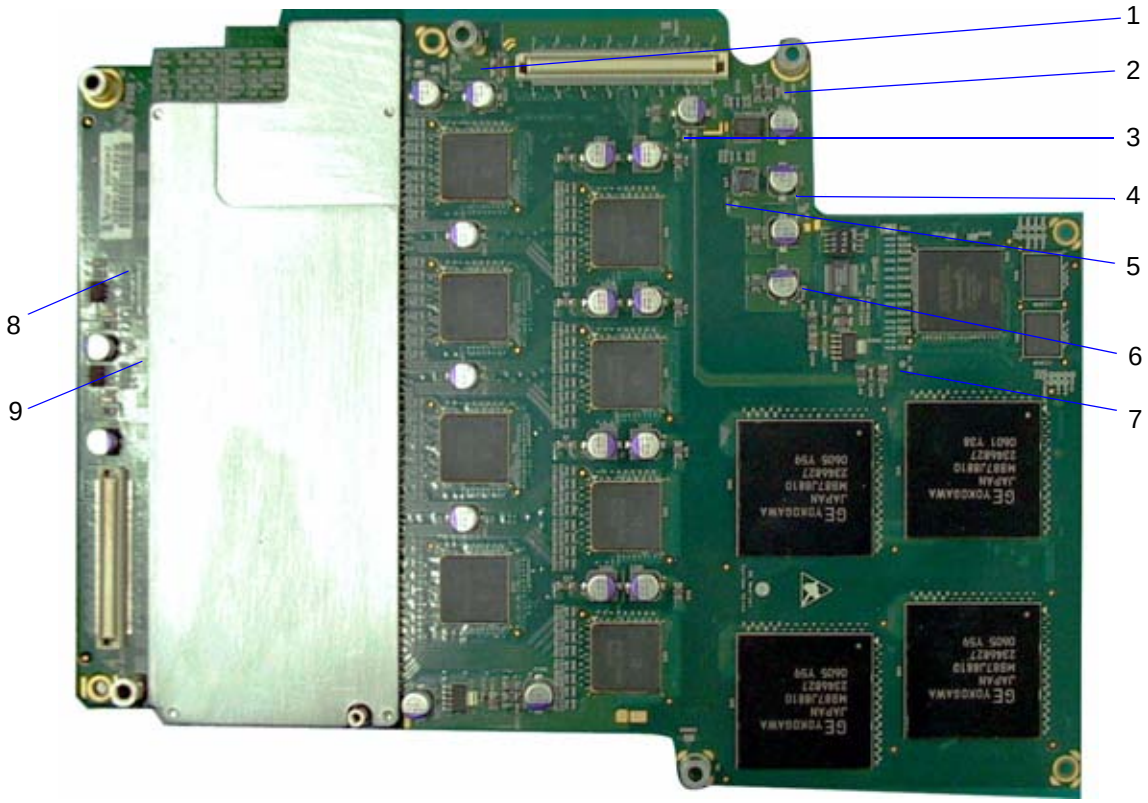



**Figure 8-14 Test points on RX64 board**

**Table 8-5 Test points values on RX64 board**

| Item | Value | Item | Value | Item | Value |
|---|---|---|---|---|---|
| 1 | AP3.5V | 2 | AP3.3V | 3 | AP1.8V |
| 4 | D1.8V | 5 | 1.8V | 6 | D3.3V |
| 7 | D1.5V | 8 | OPVCC | 9 | L_PS |

## 8-2-11 PFPC Assy (FRU No.304)

Purpose: This is a description on how to remove and replace the PFPC Assy (FRU No.304).

### 8-2-11-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-11-2 Needed Manpower

- 1 person, 30 minutes + travel

### 8-2-11-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-11-4 Removal Procedure

Refer to Figure 8-15 on page 8-25 .

1.) Pull up the Probe Cap.
2.) Unscrew three screws(1-3). [Part No: 2327793, see Figure 8-15 on page 8-25 ]
3.) Remove PFPC Assy (FRU No.304).

### 8-2-11-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

## 8-2-11 PFPC Assy (FRU No.304) (cont'd)

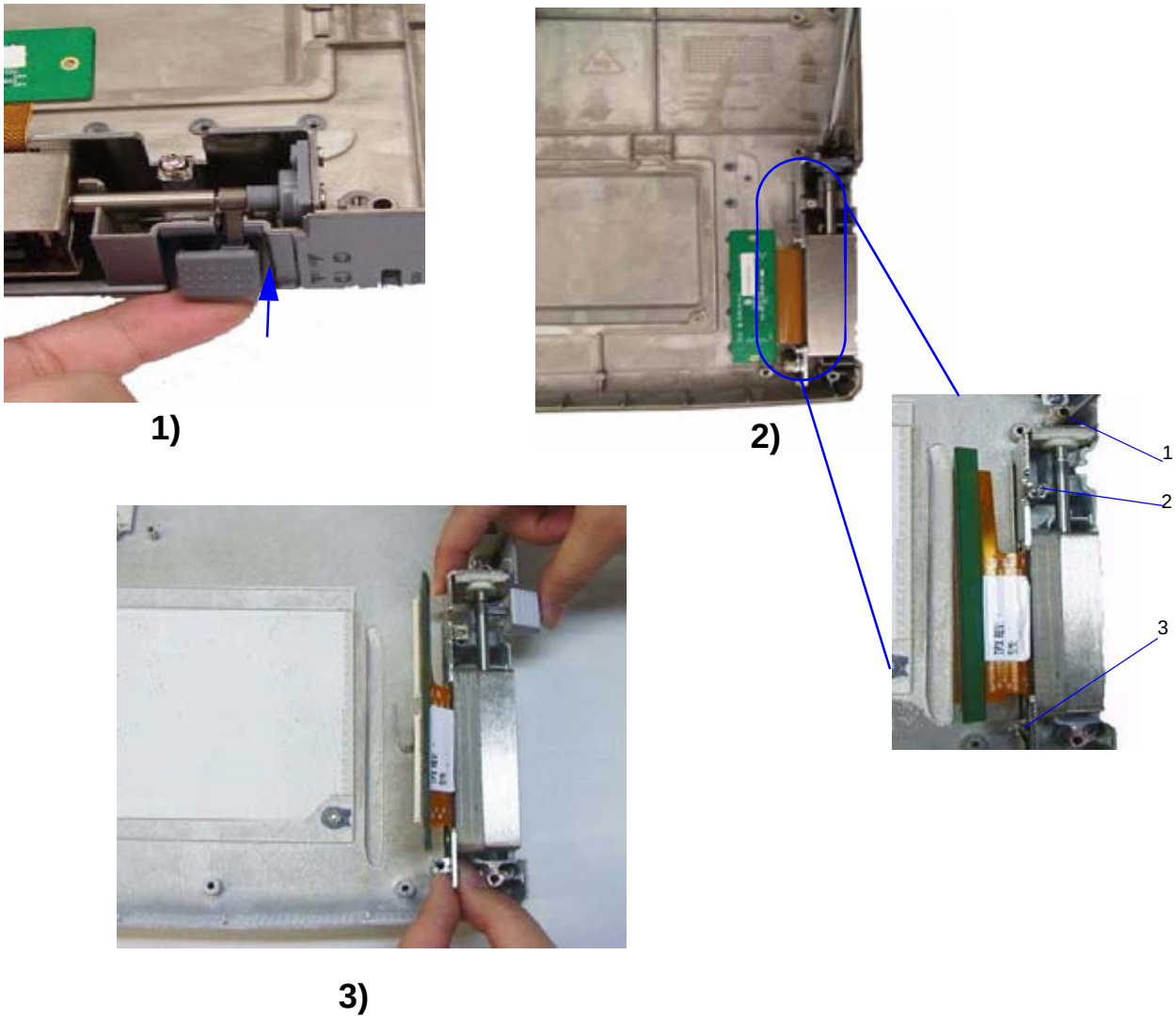



**Figure 8-15 PFPC Assy Disassembly**

## 8-2-12 CWD Assy (FRU No.305)

Purpose: This is a description on how to remove and replace the CWD Assy (FRU No.305).

### 8-2-12-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-12-2 Needed Manpower

- 1 person, 30 minutes + travel

### 8-2-12-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-12-4 Removal Procedure

Refer to Figure 8-16 on page 8-27 .

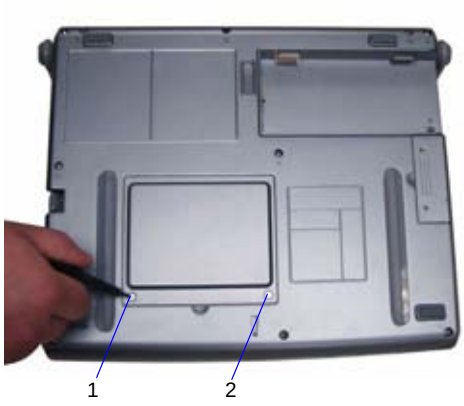
1.) Unscrew two screws(1-2) to remove the CWD cover. [Part No: 5144213, see Figure 8-16 on page 8-27 ].
2.) Unscrew two screws(1-2). [Part No: 5138465, see Figure 8-16 on page 8-27 ]
3.) Disconnect the CWD assy.

### 8-2-12-5 Mounting procedure

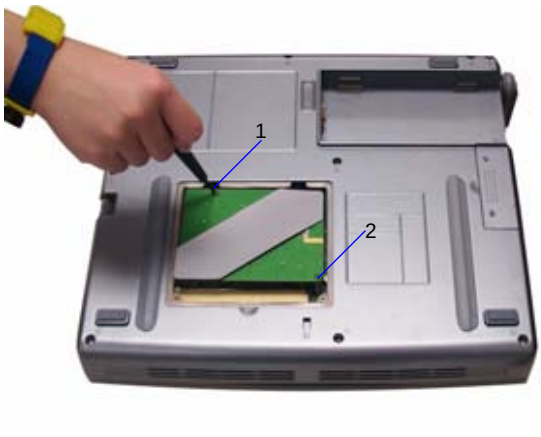
Refer to Figure 8-17 on page 8-28 .

1.) Unscrew two screws(1-2) to remove the CWD cover. [Part No: 5144213, see Figure 8-17 on page 8-28 ]
2.) Rip off the heat sponge at the side of CWD PWA, connect the CWD assy to RX64. [See Figure 8-17 on page 8-28 ]
3.) Press the CWD assy tightenedly, refer to Figure 8-17 on page 8-28 .
4.) Screw two screws(1-2) to fix the CWD assy on RX64 assy. [Part No: 5138465, see Figure 8-17 on page 8-28 ]
5.) Screw two screws to fix the CWD cover.

## 8-2-12 CWD Assy (FRU No.305) (cont'd)




1)




2)

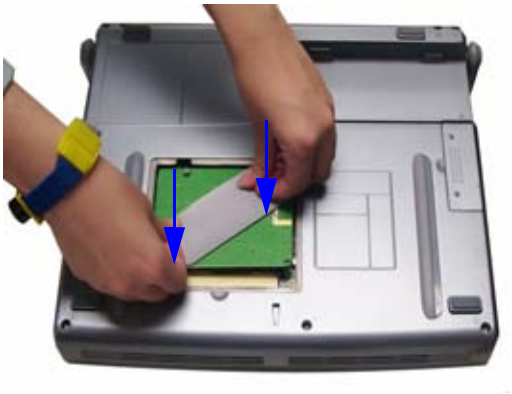
3)

**Figure 8-16 CWD Assy Disassembly**

## 8-2-12 CWD Assy (FRU No.305) (cont'd)

1)

2)



3)

4)

5)

**Figure 8-17 CWD Assy Installation**

## 8-2-13 Charge board (FRU No. 309)

Purpose: This is a description on how to remove and replace the charge board (FRU No.309).

### 8-2-13-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-13-2 Needed Manpower

- 1 person, 11 minutes + travel

### 8-2-13-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-13-4 Removal Procedure

Refer to Figure 8-18 on page 8-30 .

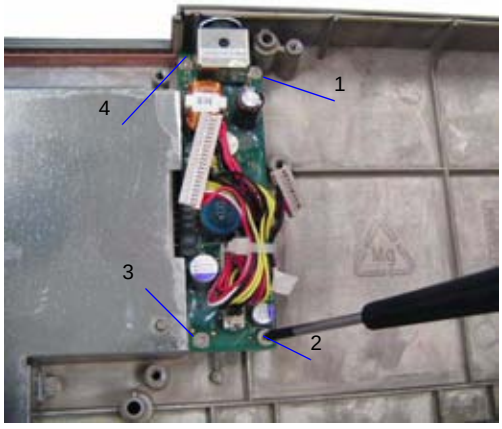
1.) Remove Battery.
2.) Unscrew four screws [Part No: 5161078, see Figure 8-18 on page 8-30 ].
3.) Remove charge board (FRU No.309).

### 8-2-13-5 Mounting procedure

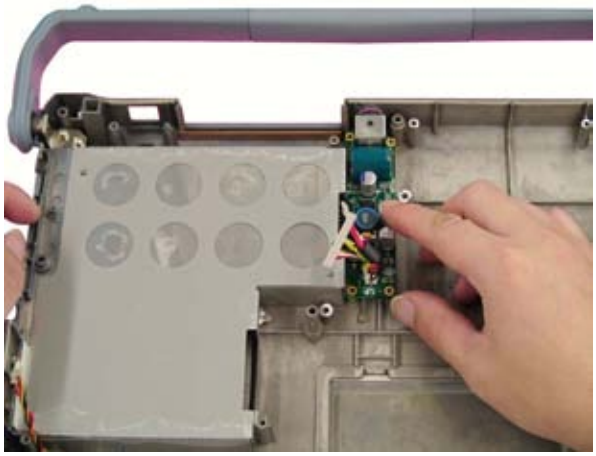
1.) Install the new parts in the reverse order of removal.

## 8-2-13 Charge board (FRU No. 309) (cont'd)

1)




2)



3)

**Figure 8-18 Charge Board Disassembly**

## 8-2-14 Harddisk Assy (FRU No. 316)

Purpose: This is a description on how to remove and replace the Harddisk Assy (FRU No.316).

### 8-2-14-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-14-2 Needed Manpower

- 1 person, 10 minutes + travel

### 8-2-14-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-14-4 Removal Procedure

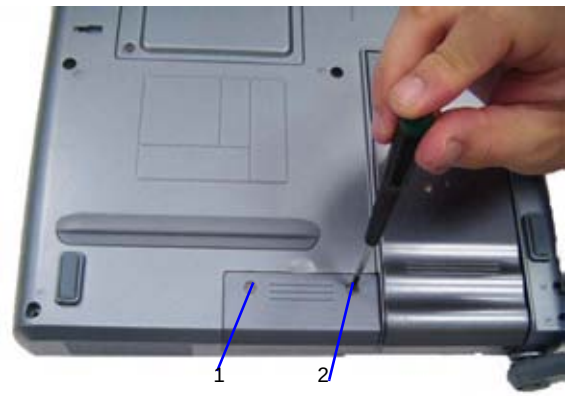
Refer to Figure 8-19 on page 8-32 .

1.) Unscrew two screws(1-2) [Part No: 5138463, see Figure 8-19 on page 8-32 ].
2.) Remove the Harddisk Assy(FRU No.316).

### 8-2-14-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

## 8-2-14 Harddisk Assy (FRU No. 316) (cont'd)




1)

2)

**Figure 8-19 Harddisk Assy Disassembly**

## 8-2-15 CPU Module (FPU No.307), Memory Module (FRU No. 308)

Purpose: This is a description on how to remove and replace the CPU module (FRU No.307) and Memory Module (FRU No. 308).

### 8-2-15-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-15-2 Needed Manpower

- 1 person, 17 minutes + travel

### 8-2-15-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-15-4 Removal Procedure

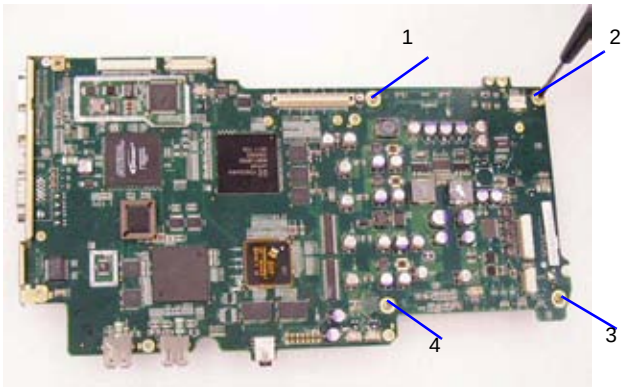
Refer to Figure 8-20 on page 8-34 .

1.) Remove TMST Assy (FRU No.301), refer to 8-2-8 "TMST Assy (FRU No. 301)" on page 8-16.
2.) Unscrew four screws(1-4) [Part No: 5162744, see Figure 8-20 on page 8-34 ].
3.) Unscrew one screw [Part No: 2327793, see Figure 8-20 on page 8-34 ].
4.) Remove CPU Card, which include CPU module (FRU No.307) and Memory Module (FRU No.308).

### 8-2-15-5 Mounting procedure

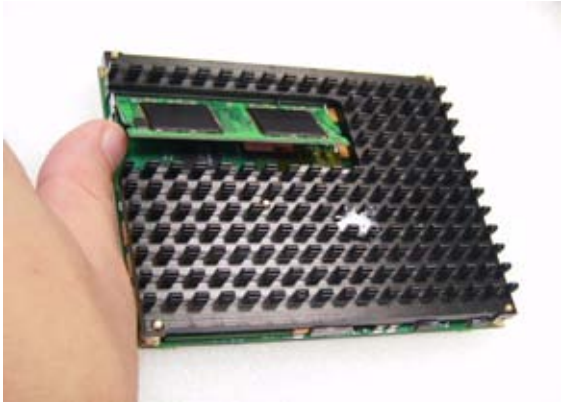
1.) Install the new parts in the reverse order of removal.

## 8-2-15 CPU Module (FPU No.307), Memory Module (FRU No. 308) (cont'd)




2)

3)



4)

**Figure 8-20 Memory Module**

## 8-2-16 Left/Right Fan Assy (FRU No. 310)

Purpose: This is a description on how to remove and replace the Left/Right Fan Assy (FRU No.310).

### 8-2-16-1 Tools

- Common phillips screwdrivers
- Allen/Unbraco wrench

### 8-2-16-2 Needed Manpower

- 1 person, 12 minutes + travel

### 8-2-16-3 Preparations

- Shut Down the System and disconnect the AC/DC power.
- Remove Battery.

### 8-2-16-4 Removal Procedure

Refer to Figure 8-21 on page 8-36 .

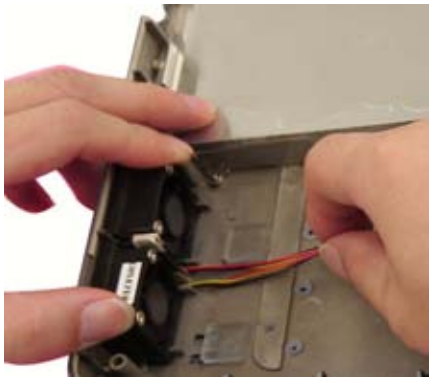
1.) Remove TMST Assy(FRU No.301), refer to 8-2-8 "TMST Assy (FRU No. 301)" on page 8-16.
2.) Remove TX64 Assy and RX64 Assy, refer to 8-2-9 "TX64 Assy (FRU No.302)" on page 8-19 & 8-2-10 "RX64 Assy (FRU No. 303)" on page 8-22.
3.) Unscrew four screws(1-4) [Part No: 2327793, see Figure 8-21 on page 8-36 ].
4.) Remove Left/Right Fan Assy(FRU No.310).

### 8-2-16-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

## 8-2-16 Left/Right Fan Assy (FRU No. 310) (cont'd)

**3)**



**4)**

**Figure 8-21 Left/Right Fan Assy Disassembly**

## 8-2-17 Handle Assy (FRU No. 313)

Purpose: This is a description on how to remove and replace the Handle Assy (FRU No.313).

### 8-2-17-1 Tools

- Plier

### 8-2-17-2 Needed Manpower

- 1person, 2 minutes + travel

### 8-2-17-3 Preparations

- Shut Down the System.

### 8-2-17-4 Removal Procedure

Refer to Figure 8-22 on page 8-38 .

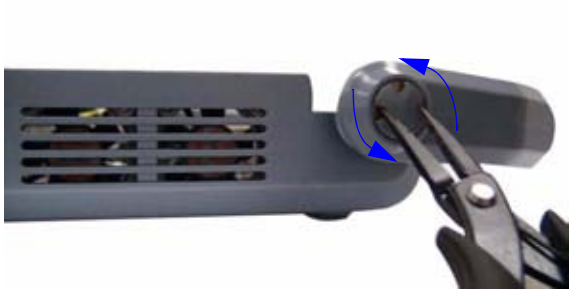
1.) Unscrew the two handle caps on both sides of the system, the rotation direction is counterclockwise.

2.) Pull out the Handle.

### 8-2-17-5 Mounting procedure

1.) Install the new parts in the reverse order of removal.

## 8-2-17 Handle Assy (FRU No. 313) (cont'd)



1)

2)

**Figure 8-22 Handle Assy Disassembly**

# Chapter 9
# Renewal Parts

## Section 9-1
## Overview

### 9-1-1 Purpose of Chapter 9

This chapter gives you an overview of Spare Parts available for the Vivid™ e.

**Table 9-6 Contents in Chapter 9**


| Section | Description | Page Number |
|---|---|---|
| 9-1 | Overview | 9-1 |
| 9-2 | List of Abbreviations | 9-1 |
| 9-3 | Renewal Parts Lists | 9-2 |
| 9-4 | Operator Console Assy | 9-3 |
| 9-5 | LCD Assy | 9-4 |
| 9-6 | Keyboard Assy | 9-6 |
| 9-7 | Bottom Assy | 9-7 |
| 9-8 | Cables | 9-12 |
| 9-9 | Isolation Cart Components | 9-13 |
| 9-10 | Accessories and Kits | 9-14 |
| 9-11 | Manuals | 9-16 |
| 9-12 | Probe | 9-16 |


## Section 9-2
## List of Abbreviations

- Assy - Assembly
- Ctrl - Control
- FRU 1 - Replacement part available in part hub
- FRU 2 - Replacement part available from the manufacturer (lead time involved)
- KBD - Keyboard
- LCD - Liquid Crystal Display
- BnV - Brightness and Volume
- RX64- Dragon Front Processor Board
- TMST - Master Board
- TX64 - Dragon Transmit Board

# Section 9-3Renewal Parts Lists

## 9-3-1 Equipment Models Covered in this Chapter

**Table 9-7 ACDC Power Pack & ACDC Power Cable list**

| Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|
| ACDC Power Pack unit | 2409198 | 100W AC Adapter | 1 | 1 |
| ACDC Power Cable | 5120411 | ACDC Power Cable for USA | 1 | 1 |
| ACDC Power Cable | 5120412 | ACDC Power Cable for Europe | 1 | 1 |
| ACDC Power Cable | 5120439 | ACDC Power Cable for China | 1 | 1 |
| ACDC Power Cable | 5120440 | ACDC Power Cable for Japan | 1 | 1 |
| ACDC Power Cable | 5125218 | ACDC Power Cable for Australia/New Zealand | 1 | 1 |
| ACDC Power Cable | 5125219 | ACDC Power Cable for United Kingdom and Ireland | 1 | 1 |
| ACDC Power Cable | 5125221 | ACDC Power Cable for India/South Africa | 1 | 1 |
| ACDC Power Cable | 5125223 | ACDC Power Cable for Argentina | 1 | 1 |
| ACDC Power Cable | 5125227 | ACDC Power Cable for Israel | 1 | 1 |
| ACDC Power Cable | 5125228 | ACDC Power Cable for Switzerland | 1 | 1 |

# Section 9-4 Operator Console Assy

**Figure 9-23 OPERATOR CONSOLE ASSY**

# Section 9-5 LCD Assy

**Figure 9-24 LCD Assy**

# Section 9-5 LCD Assy (cont'd)

**Table 9-8 LCD Assy**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| 100 | LCD Assy | 5147473-2 | LCD Assy | 1 | 1 |
| 101 | LCD Front Cover | 5133509-2 | LCD Front Cover | 1 | 1 |
| 102 | LCD BackCover | 5149676 | LCD Back Cover | 1 | 1 |
| 103 | LCD Inverter Assy | 5147731 | Inverter Assy | 1 | 1 |
| 104 | LCD panel | 5146747 | LCD panel | 1 | 2 |
| 105 | LCD cable | 5125944-3 | LCD cable | 1 | 2 |
| 106 | Cable Kits (LCD cable, KBD cables) | 5184890 | Cable Kits (LCD cable, KBD cables) | 1 | 2 |

# Section 9-6Keyboard Assy

**Figure 9-25 Keyboard Assy**

## Section 9-6 Keyboard Assy (cont'd)

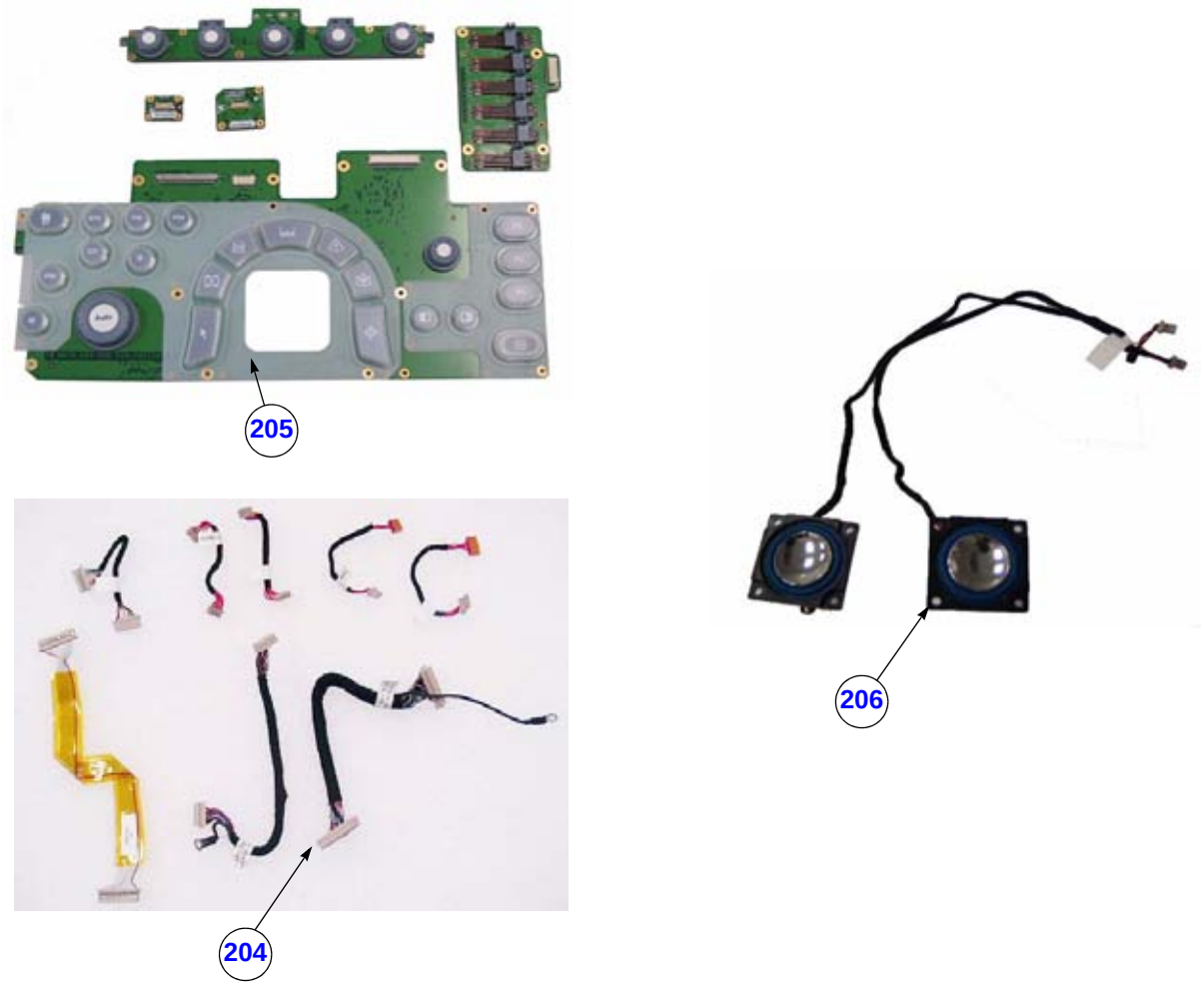



**Figure 9-26 Keyboard Assy (cont'd)**

**Table 9-9 Keyboard Assy**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| 200 | Keyboard Assy | 5172817 | Vivid™ e Keyboard | 1 | 1 |
| 201 | Trackball Assy | 5160471 | Trackball Assy | 1 | 1 |
| 202 | A/N Key Assy | 5175936 | A/N Key Assy | 1 | 2 |
| 203 | Keyboard cover Assy | 5173857 | Keyboard cover Soft menu Pane | 1 | 2 |
| 204 | KBD cable kits | 5154621 | KBD cable kits | 1 | 1 |
| 205 | Keyboard PWA kits | 5173672 | Keyboard PWA kits | 1 | 1 |
| 206 | Speaker Kits | 5155004 | Speaker Kits | 2 | 1 |

# Section 9-7Bottom Assy

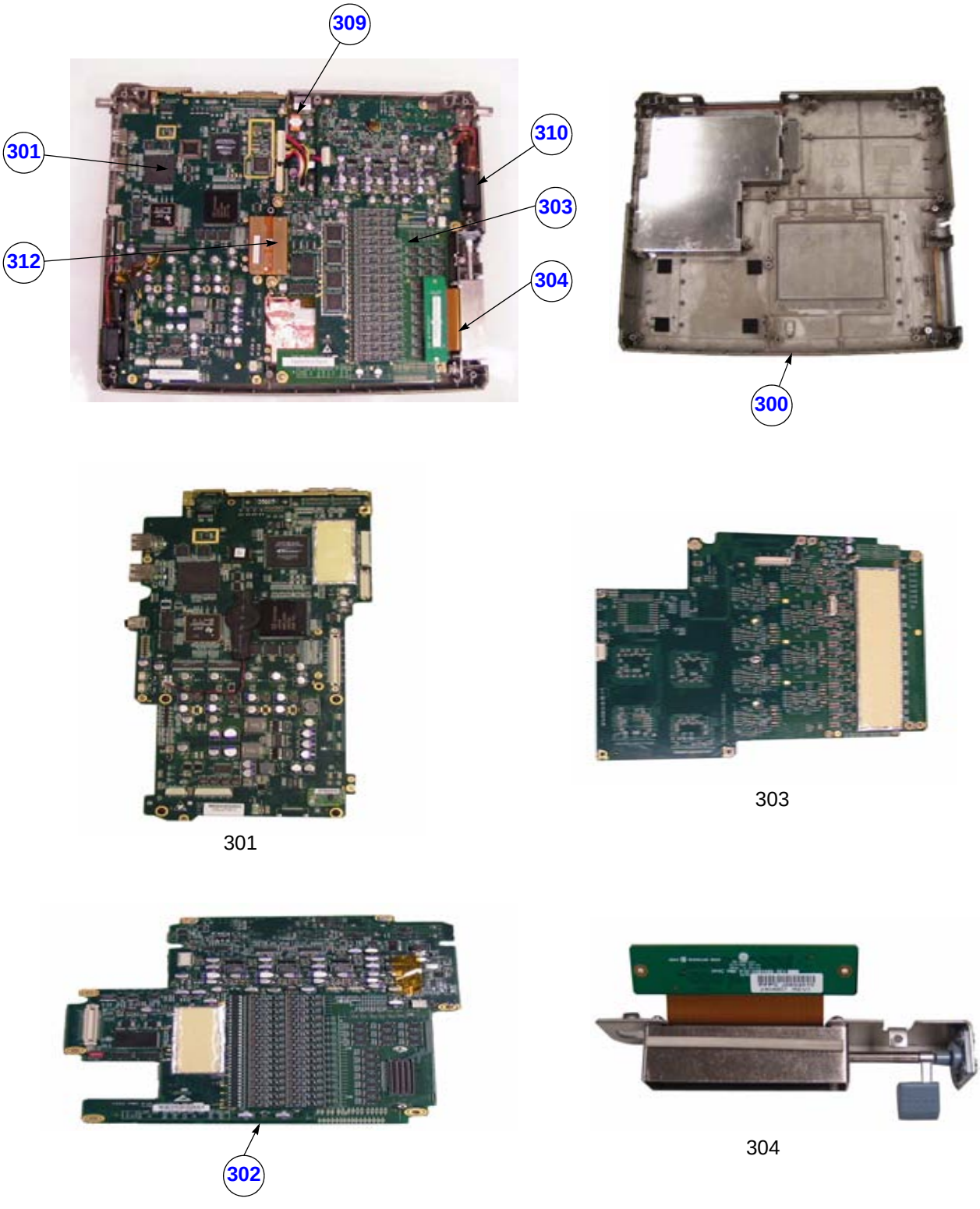
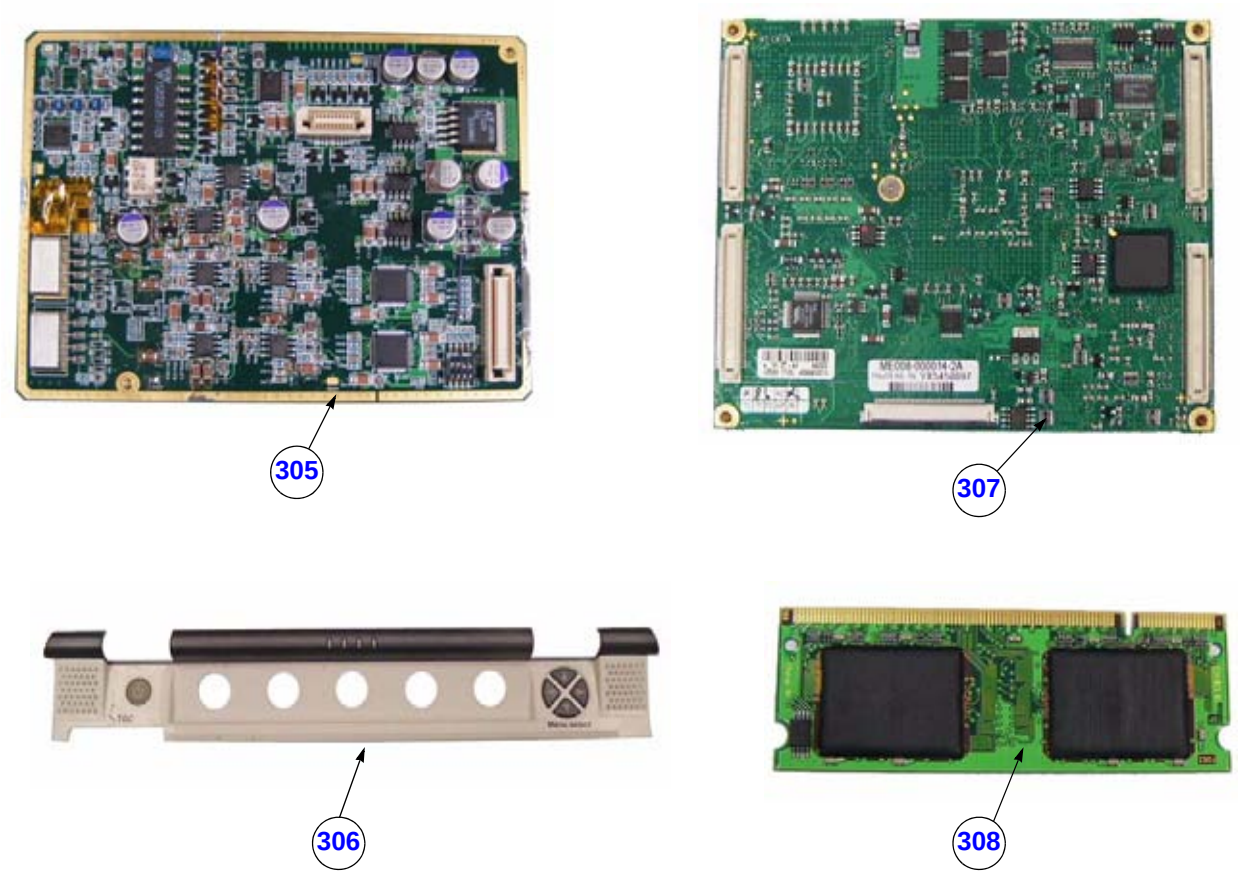



**Figure 9-27 Bottom Assy**

## Section 9-7 Bottom Assy (cont'd)




309

310

**Figure 9-28 Bottom Assy (cont'd)**

## Section 9-7 Bottom Assy (cont'd)

312

311

313

316

317

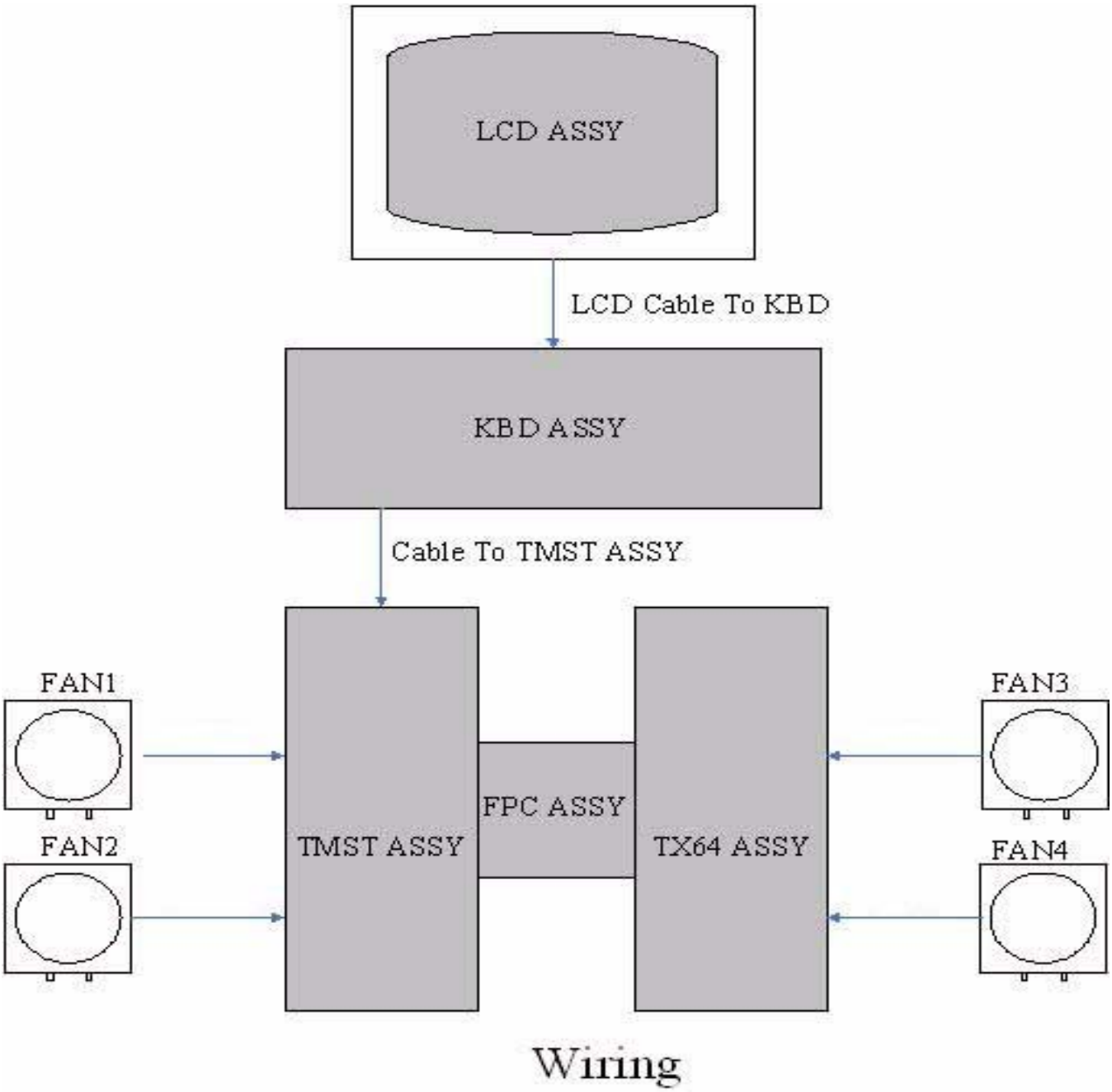
**Figure 9-29 Bottom Assy (cont'd)**

# Section 9-7 Bottom Assy (cont'd)

**Table 9-10 Bottom Assy**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| 300 | Bottom Cover Assy | 5148764 | Bottom Assy | 1 | 2 |
| 301 | TMST Board | 2406640 | TMST Board | 1 | 1 |
| 302 | TX64 Board | 2404903 | TX64 Board | 1 | 1 |
| 303 | RX64 Board | 2404906 | RX64 Board | 1 | 1 |
| 304 | Probe Connector Assy | 5148771 | Probe Connector Assy | 1 | 1 |
| 305 | CWD Board | 5124847 | CWD Board | 1 | 1 |
| 306 | Menu Panel Assy | 5148773 | Menu Panel Assy | 1 | 1 |
| 307 | PM1.4G ETX CPU Module | 5155175 | CPU Module | 1 | 1 |
| 308 | 512MB DDR Memory | 5159620 | Memory | 1 | 1 |
| 309 | Charger Board and Cable Kits | 5162038 | Charger Board and Cable | 1 | 2 |
| 310 | Left FAN Assy | 5148768 | Left FAN kits (2 Fans) | 1 | 1 |
| | Right FAN Assy | 5173403-3 | Right FAN kits (2 Fans) | 1 | 1 |
| 311 | LCD and Handle Hinge kits | 5155166 | Hinge kits | 1 | 1 |
| 312 | TMST2TX64 Assy | 2406733 | TMST2TX64 Assy | 1 | 2 |
| 313 | Handle Kits | 5154937 | Handle Assy | 1 | 2 |
| 314 | Screw Kits | 5154486 | Screw Kits | 1 | 2 |
| 315 | Rubber Kits | 5154731 | Rubber Kits | 1 | 2 |
| 316 | HDD Assy | 5174862 | HDD Assy | 1 | 1 |
| 317 | CMOS Battery | 5145407 | CMOS Battery | 1 | 1 |

# Section 9-8
# Cables




Wiring

# Section 9-9Isolation Cart Components

**Figure 9-30 Isolation Cart Components**

**Table 9-11 Isolation Cart Components**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| 501 | Wheels | 5183729 | Wheels | 1 | 2 |
| 502 | Isolation transformer 110V | 5180439 | Isolation transformer 110V | 1 | 2 |
| | Isolation transformer 220V | 5180376 | Isolation transformer 220V | 1 | 2 |
| 503 | Handle kits | 5183627 | Handle kits | 1 | 2 |
| 504 | Probe holder kits | 5183958 | Probe holder kits | 1 | 2 |
| 505 | Hardware kits | 5183719 | Hardware kits | 1 | 2 |
| 506 | USA class cable kits | 5182671 | USA class cable kits | 1 | 2 |
| | European class cable kits | 5182937 | European class cable kits | 1 | 2 |
| | Chinese class cable kits | 5182252 | Chinese class cable kits | 1 | 2 |
| | Japanese class cable kits | 5182323 | Japanese class cable kits | 1 | 2 |
| | Australia/New Zealand class cable kits | 5182095 | Australia/New Zealand class cable kits | 1 | 2 |
| | United Kingdom and Ireland class cable kits | 5182890 | United Kingdom and Ireland class cable kits | 1 | 2 |
| | Denmark class cable kits | 5182310 | Denmark class cable kits | 1 | 2 |
| | India/South Africa class cable kits | 5182038 | India/South Africa class cable kits | 1 | 2 |
| | Argentina class cable kits | 5182881 | Argentina class cable kits | 1 | 2 |
| | Israel class cable kits | 5182625 | Israel class cable kits | 1 | 2 |
| | Switzerland class cable kits | 5182631 | Switzerland class cable kits | 1 | 2 |

**Table 9-11 Isolation Cart Components**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| 507 | Security lock | 5183906 | Security lock for Twin | 1 | 2 |
| 508 | Isolation Cart (110V) | 5176271 | Isolation Cart (110V) | 1 | 2 |
| | Isolation Cart (220V) | 5177329 | Isolation Cart (220V) | 1 | 2 |

# Section 9-10
# Accessories and Kits

**Table 9-12 Accessories and Kits**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| 601 | Battery Pack | 5120410 | Battery | 1 | 2 |
| 602 | DVD-RW (USA) | 5151233 | LG DVD-RW | 1 | 2 |
| 602A | DVD-RW (USA) | 5151233-2 | LITEON DVD-RW | 1 | 2 |
| 603 | DVD-RW (CHN) | 5151255 | LG DVD-RW | 1 | 2 |
| 603A | DVD-RW (CHN) | 5151255-2 | LITEON DVD-RW | 1 | 2 |
| 604 | DVD-RW (GER) | 5151234 | LG DVD-RW | 1 | 2 |
| 604A | DVD-RW (EUR) | 5151234-2 | LITEON DVD-RW | 1 | 2 |
| 605 | DVD-RW (JPN) | 5182891-2 | LITEON DVD-RW | 1 | 2 |
| 606 | USB Footswitch | 5151236 | 3 Pedal Footswitch | 1 | 2 |
| 607 | USB Footswitch | 2327703 | 1 Pedal Footswitch | 1 | 2 |
| 608 | USB Wireless Card | 5172876 | USB Wireless Card | 1 | 2 |
| 609 | UP-D897 Digital B/W Printer (USA) | 5151259 | B/W Printer | 1 | 2 |
| 610 | UP-D897 Digital B/W Printer (EU) | 5151261 | B/W Printer | 1 | 2 |
| 611 | UP-D897 Digital B/W Printer (CHN) | 5151262 | B/W Printer | 1 | 2 |
| 612 | UP-D897 Digital B/W Printer (JPN) | 5151263 | B/W Printer | 1 | 2 |
| 613 | UP-D23MD Digital Color Printer (US) | 5133107 | Color Printer | 1 | 2 |
| 614 | UP-D23MD Digital Color Printer (EU) | 5133108 | Color Printer | 1 | 2 |
| 615 | UP-D23MD Digital Color Printer (CN) | 5133106 | Color Printer | 1 | 2 |
| 616 | UP-D23MD Digital Color Printer (JP) | 5133109 | Color Printer | 1 | 2 |
| 617 | System & Application software DVD | 5175298 | System & Application software DVD(R4.0.0) | 1 | 2 |
| 617A | System & Application software DVD | 5175298-2 | System & Application software DVD(R4.0.1) | 1 | 2 |
| 617B | System & Application software DVD | 5175298-3 | System & Application software DVD(R4.0.2) | 1 | 2 |

**Table 9-12 Accessories and Kits**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| 618 | HP460 Printer Kits (HP460+PIT) -US | 5175689 | Deskjet Color Printer | 1 | 2 |
| 619 | HP460 Printer Kits (HP460+PIT) -EU | 5175988 | Deskjet Color Printer | 1 | 2 |
| 620 | HP460 Printer Kits (HP460+PIT) -CN | 5175350 | Deskjet Color Printer | 1 | 2 |
| 621 | HP460 Printer Kits (HP460+PIT) -JP | 5175546 | Deskjet Color Printer | 1 | 2 |
| 622 | HP K550 PC Printer -US | 5175122 | PC Color Printer | 1 | 2 |
| 623 | HP K550 PC Printer -EU | 5175833 | PC Color Printer | 1 | 2 |
| 624 | HP K550 PC Printer -CN | 5175554 | PC Color Printer | 1 | 2 |
| 625 | HP K550 PC Printer-JP | 5175898 | PC Color Printer | 1 | 2 |
| 626 | ECG USB Cable | 5146055 | Option Part | 1 | 2 |
| 627 | ECG Module | 5129487 | Option Part | 1 | 2 |
| 628 | ECG Detachable Cable AHA | 5146056 | Option Part | 1 | 2 |
| 629 | ECG Detachable Cable IEC | 5146739 | Option Part | 1 | 2 |
| 630 | ECG Module with Chinese Label | 5149641 | Option Part | 1 | 2 |
| 631 | USB Hub | 5184951 | Option Part | 1 | 2 |
| 632 | Vivid e LOGO Kit | 5183684 | Vivid e LOGO Kit | 1 | 2 |
| 633 | Emergency Disk | 5173797 | USB 2.0 mobile HDD | 1 | 2 |

# Section 9-11Manuals

**Table 9-13 MANUALS**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| | Vivid™ e Service Manual | 5197293-100 | Service Manual | 1 | N |
| **System User Manuals** | | | | | |
| | User Manual, Vivid™ e, English | 5196492-100 | Basic User Manual | 1 | N |
| **System Quick Start Guide** | | | | | |
| | Quick Start Guide, Vivid™ e, English | 5197143 -100 | Quick Start Guide | 1 | N |

# Section 9-12Probe

**Table 9-14 Probes**

| Item | Part Name | Part Number | Description | Quantity | FRU |
|---|---|---|---|---|---|
| 701 | 4C-RS | 5131629 | Probe (Center Frequency: 3.2MHz) | 1 | 1 |
| 702 | i12L-RS | 2377942 | Probe (Center Frequency: 5.6MHz) | 1 | 1 |
| 703 | 8L-RS | 2376127 | Probe (Center Frequency: 6.2MHz) | 1 | 1 |
| 704 | 3S-RS | 2355686 | Probe (Center Frequency: 2.0MHz) | 1 | 1 |

# Chapter 10
# Care & Maintenance

## Section 10-1
## Overview

### 10-1-1 Periodic Maintenance Inspections

It has been determined by engineering that your Vivid™ e system does not have any high wear components that fail with use, therefore no Periodic Maintenance Inspections are mandatory. Some Customers Quality Assurance Programs may require additional tasks and or inspections at a different frequency than listed in this manual.

### 10-1-2 Purpose of Chapter 10

This chapter describes **Care & Maintenance** on the scanner and peripherals. These procedures are intended to **maintain the quality** of the ultrasound **systems performance**. Read this chapter completely and familiarize yourself with the procedures before performing a task.

**Table 10-1 Contents in Chapter 10**


| Section | Description | Page Number |
|---|---|---|
| 10-1 | Overview | 10-1 |
| 10-2 | Why do Maintenance | 10-2 |
| 10-3 | Maintenance Task Schedule | 10-2 |
| 10-4 | Tools Required | 10-4 |
| 10-5 | System Maintenance | 10-5 |
| 10-6 | Using a Phantom | 10-10 |
| 10-7 | Electrical Safety Tests | 10-10 |
| 10-8 | When There's Too Much Leakage Current... | 10-18 |


**CAUTION** **Practice good ESD prevention. Wear an anti–static strap when handling electronic parts and even when disconnecting/connecting cables.**

**DANGER** **BE SURE TO DISCONNECT THE SYSTEM POWER PLUG BEFORE YOU REMOVE ANY PARTS. BE CAUTIOUS WHENEVER POWER IS STILL ON AND COVERS ARE REMOVED.**

**CAUTION** **Do not pull out or insert circuit boards while power is ON.**

**CAUTION** **Do not operate this unit unless all board covers and frame panels are securely in place. System performance and cooling require this.**

# Section 10-2
# Why do Maintenance

## 10-2-1 Keeping Records

It is good business practice that ultrasound facilities maintain records of periodic and corrective maintenance. The Ultrasound Periodic Maintenance Inspection Certificate provides the customer with documentation that the ultrasound scanner is maintained on a periodic basis.

A copy of the Ultrasound Periodic Maintenance Inspection Certificate should be kept in the same room or near the scanner.

## 10-2-2 Quality Assurance

In order to gain accreditation from organizations such as the American College of Radiology (USA), it is the customer's responsibility to have a quality assurance program in place for each scanner. The program must be directed by a medical physicists, the supervising radiologist/physician or appropriate designee.

Routine quality control testing must occur regularly. The same tests are performed during each period so that changes can be monitored over time and effective corrective action can be taken.

Testing results, corrective action and the effects of corrective action must be documented and maintained on the site.

Your GE service representative can help you with establishing, performing and maintaining records for a quality assurance program. Please contact us for coverage information and/or price for service.

# Section 10-3
# Maintenance Task Schedule

## 10-3-1 How often should care & maintenance tasks be performed?

The Care & Maintenance Task Schedule (provided on page 10-3) specifies how often your Vivid™ e should be serviced and outlines items requiring special attention.

*NOTE: It is the customer's responsibility to ensure the Vivid™ e care & maintenance is performed as scheduled in order to retain its high level of safety, dependability and performance.*

Your GE Service Representative has an in-depth knowlegde of your Vivid™ e ultrasound scanning system and can best provide competent, efficient service. Please contact us for coverage information and/or price for service.

The service procedures and recommended intervals shown in the Care & Maintenance Task Schedule assumes that you use your Vivid™ e for an average patient load (10-12 per day) and use it as a primary mobile unit which is transported between diagnostic facilities.

*NOTE: If conditions exist which exceed typical usage and patient load, then it is recommended to increase the maintenance frequencies.*

**Table 10-2 Customer Care Schedule**

| Service at Indicated Time | Daily | Weekly | Monthly | Per Facilities QA Program | Notes |
|---|---|---|---|---|---|
| Clean Probes | •* | | | | * or before each use |
| Inspect AC Mains Cable | | | • | | Mobile Unit Check Weekly |
| Inspect Cables and Connectors | | | • | | |
| Clean Console | | | • | | |
| Clean LCD | | | • | | |
| Console Leakage Current Checks | | | | **See Note** | **Twice Annually** |
| Peripheral Leakage Current Checks | | | | **See Note** | **Twice Annually** |
| Surface Probe Leakage Current Checks | | | | **See Note** | **Twice Annually** |
| Endocavity Probe Leakage Current Checks | | | | **See Note** | **Quarterly Annually** |
| Measurement Accuracy Checks | | | | **See Note** | **Twice Annually** |
| Probe/Phantom Checks | | | | **See Note** | **Quarterly Annually** |

*NOTE: May require specialized equipment to complete*

# Section 10-4
# Tools Required

## 10-4-1 Special Tools, Supplies and Equipment

### 10-4-1-1 Specific Requirements for Care & Maintenance

**Table 10-3 Overview of Requirements for Care & Maintenance**

| Tool | Part Number | Comments |
|---|---|---|
| Digital Volt Meter (DVM) | | |
| Anti Static Kit | 46–194427P231<br>46–194427P279<br>46–194427P369<br>46–194427P373<br>46–194427P370 | Kit includes anti–static mat, wrist strap and cables for 200 to 240 V system<br>3M #2204 Large adjustable wrist strap<br>3M #2214 Small adjustable wrist strap<br>3M #3051 conductive ground cord |
| Anti Static Vacuum Cleaner | 46–194427P278<br>46–194427P279 | 120V<br>230V |
| Safety Analyzer | 46–285652G1 | DALE 600 KIT (or equivalent) for electrical tests |
| QIQ Phantom | E8370RB | RMI Grayscale Target Model 403GS |
| B/W Printer Cleaning Sheet | | See printer user manual for requirements |
| Color Printer Cleaning Sheet | | See printer user manual for requirements |
| Disposable Gloves | | |

# Section 10-5
# System Maintenance

## 10-5-1 Preliminary Checks

The preliminary checks take about 15 minutes to perform. Refer to the system user documentation whenever necessary.

**Table 10-4 System Checks**

| Step | Item | Description |
|---|---|---|
| 1 | Ask & Listen | Ask the customer if they have any problems or questions about the equipment. |
| 2 | Paperwork | Fill in the top of the Ultrasound Inspection Certificate (see page 10- 19). Note all probes and system options. |
| 3 | Power up | With AC input.<br>Turn the system power on and verify that all fans and peripherals turn on. Watch the displays during power up to verify that no warning or error messages are displayed.<br>Check the Battery recharging.<br>Without AC input, use internal battery. |
| 4 | Probes | Verify that the system properly recognizes all probes. |
| 5 | Displays | Verify proper display on the LCD. |
| 6 | Presets | Backup all customer presets on an DVD-RW. |

## 10-5-2 Functional Checks (See Also Chapter 4)

The functional checks take about 60 minutes to perform. Refer to the system user documentation whenever necessary.

### 10-5-2-1 System Checks

**Table 10-5 System Functional Checks**

| ÷ | Step | Description |
|---|---|---|
| | B-Mode | Verify basic B-Mode (2D) operation. Check the basic system controls that affect this mode of operation. |
| | CF-Mode | Verify basic CF-Mode (Color Flow Mode) operation. Check the basic system controls that affect this mode of operation. |
| | Doppler Modes | Verify basic Doppler operation (PW if available). Check the basic system controls that affect this mode of operation. |
| | M-Mode | Verify basic M-Mode operation. Check the basic system controls that affect this mode of operation. |
| | *Applicable Software Options | Verify the basic operation of all optional modes such as Multi-Image, 3D, Harmonics, Cine,... etc. Check the basic system controls that affect each options operation. |
| | Xmit/Recv Elements | Use the Visual Channel Utility on the loop connect to verify that all system xmit/recv channels are functional. |
| | Keyboard Test | Perform the Keyboard Test Procedure to verify that all keyboard controls are OK. |
| | LCD | Verify basic LCD display functions. Refer to Chapter 3 of the User Manual. |
| | Software Menu check | Verify Software Menu display functions. Refer to Chapter 3 of the User Manual. |
| | Measurements | Scan a gray scale phantom and use the measurement controls to verify distance and area calculation accuracy. Refer to the User Manual, Chapter 18, for measurement accuracy specifications. |

*NOTE: * Some software may be considered standard depending upon system model configuration.*

#### 10-5-2-2 Peripheral/Option Checks

If any peripherals or options are not part of the system configuration, the check can be omitted. Refer to the User Manual for a list of approved peripherals/options.

**Table 10-6 GE Approved Peripheral/Hardware Option Functional Checks**

| Step | Item | Description |
|---|---|---|
| 1 | B/W Printer | Verify hardcopy output of the B/W video page printer. Clean heads and covers if necessary. |
| 2 | Color Printer | Verify hardcopy output of the Color video page printer. Clean heads and covers if necessary. |
| 3 | DICOM | Verify that DICOM is functioning properly. Send an image to a DICOM device. |
| 4 | Footswitch | Verify that the footswitch is functioning as programed. Clean as necessary. |
| 5 | ECG | Verify basic operation with customer. |
| 6 | DVD | Verify that the DVD is functioning properly. Clean heads and covers if necessary. |

## 10-5-3 Input Power

#### 10-5-3-1 AC/DC Adapter Inspection

**Table 10-7 AC/DC Adapter Inspection**

| Step | Item | Description |
|---|---|---|
| 1 | Unplug Cord | Disconnect the mains cable from the wall and system. |
| 2 | Inspect | Inspect it and its connectors for damage of any kinds. |
| 3 | Verify | Verify that the LINE wires are properly attached to the terminals, and that no strands may cause a short circuit. |

## 10-5-4 Cleaning

#### 10-5-4-1 General Cleaning

**Table 10-8 General Cleaning**

| Step | Item | Description |
|---|---|---|
| 1 | Console | Remove the battery. Use a fluid detergent in warm water on a soft, damp cloth to carefully wipe the entire system. Be careful not to get the cloth too wet so that moisture does not enter the console. |
| 2 | Probe Holder | Clean probe holders. (they may need to be soaked to remove excess gel). |
| 3 | LCD | Use a soft, non-abrasive folder cloth. Gently wipe the LCD face. DO NOT use a glass cleaner that has a hydrocarbon base (such as Benzene, Methy Alcohol or Methy Ethyl Ketone) on LCD with the filter (anti-glare shield). |

## 10-5-5 Physical Inspection

**Table 10-9 Physical Checks**

| Step | Item | Description |
|---|---|---|
| 1 | Labeling | Verify that all system labeling is present and in readable condition. Refer to User Manual, ..... for details. |
| 2 | Scratches & Dents | Inspect the console for dents, scratches or cracks. |
| 3 | Control Panel | Inspect keyboard and control panel. Note any damaged or missing items. |
| 4 | Cables & Connectors | Check all internal cable harnesses and connectors for wear and secure connector seating. Pay special attention to footswitch assembly and probe strain or bend reliefs. |
| 5 | Shielding & Covers | Check to ensure that all EMI shielding, internal covers, air flow panels and screws are in place. Missing covers and hardware could cause EMI/RFI problems while scanning. |
| 6 | External I/O | Check all connectors for damage. |
| 7 | Op Panel Lights | Check for proper operation of all operator panel and Freeze Key light. |

## 10-5-6 Optional Diagnostic Checks

Optionally you can access the diagnostic software as described in Chapters 5 or 7. View the error logs and run desired diagnostics.

### 10-5-6-1 View the Logs

1.) Review the system error log for any problems.
2.) Check the temperature log to see if there are any trends that could cause problems in the future.
3.) Check the Configuration Log; update if needed.

## 10-5-7 Probe Maintenance

### 10-5-7-1 Probe Related Checks

**Table 10-10 Probe Related Checks**

| Step | Item | Description |
|---|---|---|
| 1 | Probe Holder | Clean probe holders (they may need to be soaked to remove excess gel). |
| 2 | Probes | Thoroughly check the system probe connectors and remove dust from inside the connector sockets if necessary. Visually check for bent, damaged or missing pins |

### 10-5-7-2 Basic Probe Care

The system user manuals and various probe handling cards provide a complete description of probe care, maintenance, cleaning and disinfection. Ensure that you are completely familiar with the proper care of GE probes.

Ultrasound probes can be easily damaged by improper handling. See the User Manual and probe care cards for more details. Failure to follow these precautions can result in serious injury and equipment damage. Failure to properly handle or maintain a probe may also void its warranty.

Any evidence of wear indicates the probe cannot be used.

Do a visual check of the probe pins and system sockets before plugging in a probe.

### 10-5-7-3 Basic Probe Cleaning

Refer to the User's Manual for details on probe cleaning.

*NOTE: To help protect yourself from blood borne diseases, wear approved disposable gloves. These are made of nitrile derived from vegetable starch to prevent allergic latex reactions.*

*NOTE: Failure to follow the prescribed cleaning or disinfection procedures will void the probe's warranty. DO NOT soak or wipe the lens with any product not listed in the User Manual. Doing so could result in irreparable damage to the probe. Follow care instructions that came with the probe.*

*NOTE: Disinfect a defective probe before you return it. Be sure to tag the probe as being disinfected.*

# Section 10-6
# Using a Phantom

See the Basic User Manual "*Customer Maintenance*" for information on using a phantom and quality assurance tests.

# Section 10-7
# Electrical Safety Tests

## 10-7-1 Safety Test Overview

The electrical safety tests in this section are based on and conform to IEC 60601-1 Medical Equipment Safety Standards. They are intended for the electrical safety evaluation of cord-connected, electrically operated, patient care equipment. If additional information is needed, refer to the IEC 60601-1 documents.

**WARNING** ***THE USER MUST ENSURE THAT THE SAFETY INSPECTIONS ARE PERFORMED AT LEAST EVERY 6 MONTHS ACCORDING TO THE REQUIREMENTS OF THE PATIENT SAFETY STANDARD IEC-EN 60601-1. ONLY TRAINED PERSONS ARE ALLOWED TO PERFORM THE SAFETY INSPECTIONS MENTIONED ABOVE.***

**CAUTION** **To avoid electrical shock, the unit under test must not be connected to other electrical equipment. The unit under test must not be contacted by users or patients while performing these tests.**

**CAUTION** **Possible risk of infection. Do not handle soiled or contaminated probes and other components that have been in patient contact. Follow appropriate cleaning and disinfecting procedures before handling the equipment.**

Test the system, peripherals and probes for leakage current. Excessive leakage current can cause injury or death in sensitive patients. High leakage current can also indicate degradation of insulation and a potential for electrical failure. Do not use probes or equipment having excessive leakage current.

To minimize the risk that a probe may shock someone the customer should:

- Not use a probe that is cracked or damaged in any way
- Check probe leakage current:
    * Based on your facilities QA program for surface probes
    * Based on your facilities QA program for endocavitary probes
    * whenever probe damage is suspected

## 10-7-2 GEMS Leakage Current Limits

The following limits are summarized for IEC 60601-1 Medical Equipment Safety Standards. These limits are GEMS standards and in some cases are lower than the above standards listed.

**Table 10-11 Chassis Leakage Current Limits—Accessible Metal Surfaces**

| Country | Normal Condition | Open Ground | Reverse Polarity | Open Neutral |
|---|---|---|---|---|
| All (Except USA & Canada) | 0.1 mA | 0.5 mA | 0.5 mA | 0.5 mA |
| USA & Canada | 0.1 mA | 0.3 mA | 0.3 mA | 0.3 mA |

**Table 10-12 Type BF Applied Part Leakage Current Limits - Probes surface**

| Country | Normal Condition | Open Ground | Reverse Polarity | Open Neutral | *Mains Applied |
|---|---|---|---|---|---|
| All | 0.1 mA | 0.5 mA | 0.5 mA | 0.5 mA | 5.0 mA |

**Table 10-13 Type CF Applied Part Leakage Current Limits - ECG Connections**

| Country | Normal Condition | Open Ground | Reverse Polarity | Open Neutral | *Mains Applied |
|---|---|---|---|---|---|
| All | 0.01 mA | 0.05 mA | 0.05 mA | 0.05 mA | 0.05 mA |

*NOTE: *Mains Applied refers to the sink leakage test where mains (supply) voltage is applied to the part to determine the amount of current that will pass (or sink) to ground if a patient contacted mains voltage.*

The following tests are performed at the factory and should be performed at the site. These tests are: chassis leakage current, and probe leakage current. All measurements are made with an electrical safety analyzer.

## 10-7-3 Outlet Test - Wiring Arrangement

Test all outlets in the area for proper grounding and wiring arrangement by plugging in the neon outlet tester and noting the combination of lights that are illuminated. Any problems found should be reported to the hospital immediately and the receptacle should not be used.

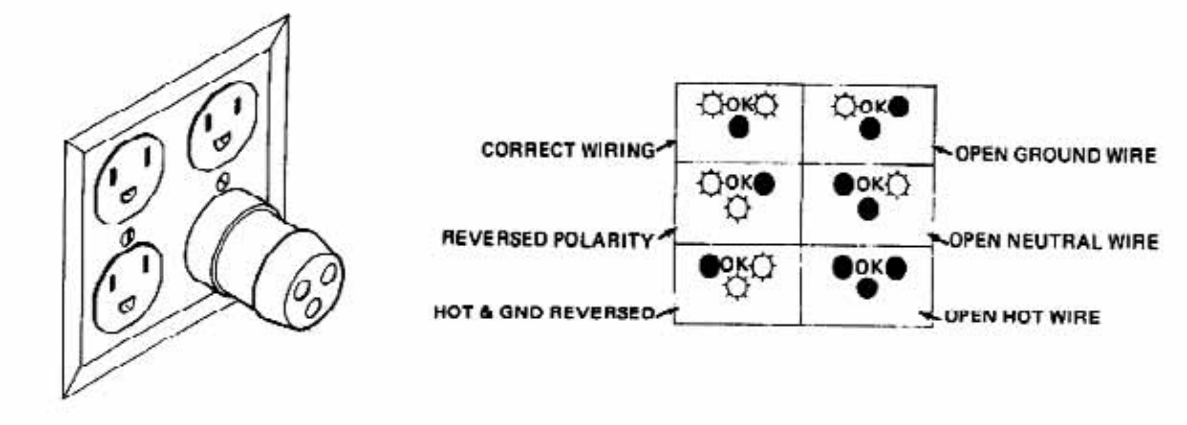



**Figure 10-1 Typical Alternate Outlet Tester**

*NOTE: No outlet tester can detect the condition where the Neutral (grounded supply) conductor and the Grounding (protective earth) conductor are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.*

## 10-7-4 Chassis Leakage Current Test

### 10-7-4-1 Definition

This test measures the current that would flow in a grounded person who touched accessible metal parts of the bedside station if the ground wire should break. The test verifies the isolation of the power line from the chassis. The meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit On and Off, with the power line polarity Normal and Reversed. Record the highest reading.

**CAUTION** **Electric Shock Hazard. When the meter's ground switch is OPEN, don't touch the unit!**

**CAUTION** **Equipment damage possibility. Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged.**

### 10-7-4-2 Generic Procedure

The test verifies the isolation of the power line from the chassis. The testing meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit ON and OFF, with the power line polarity Normal and Reversed. Record the highest reading of current.

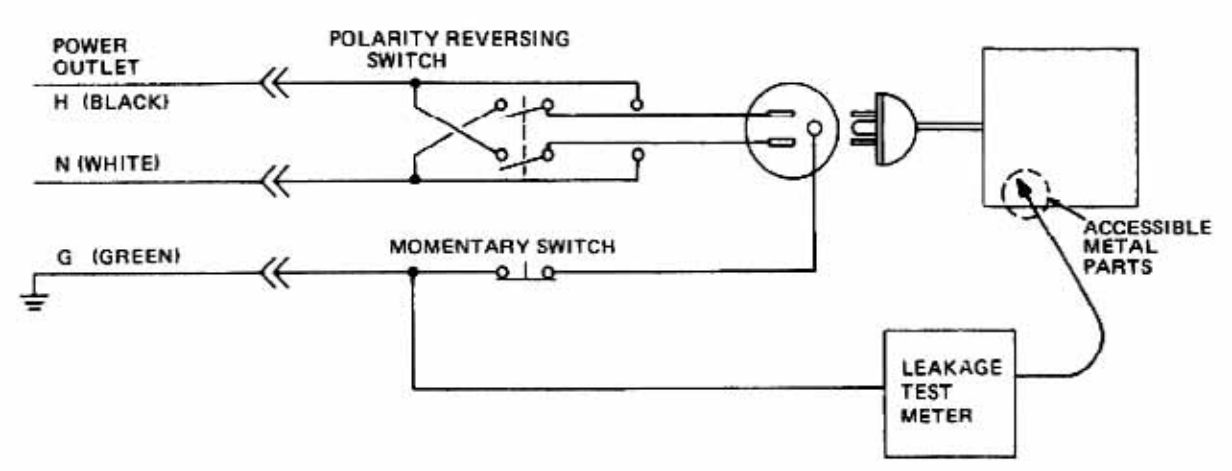



**Figure 10-2 Set Up for Chassis Source Leakage Current, IEC 601-1 Clause 19 - Continuos Leakage Currents and Patient, Auxiliary Currents**

When using the Microguard or a similar test instrument, its power plug may be inserted into the wall outlet and the equipment under test is plugged into the receptacle on the panel of the meter. This places the meter in the grounding conductor and the current flowing from the case to ground will be indicated in any of the current ranges. The maximum allowable limit for chassis source leakage is shown in Table 10-11.

### 10-7-4-3 Data Sheet for enclosure Source Leakage Current

The test passes when all readings measure less than the value shown in Table 10-11. Record all data on the PM Inspection Certificate.

**Table 10-14 Typical Data Sheet for enclosure Source Leakage Current**

| Unit Power | Tester Polarity Switch | Tester Neutral or Ground Switch | Test 1 Speaker Cover | Test 2 Real Panel Metal Parts | Optional Test 3 | Optional Test 4 |
|---|---|---|---|---|---|---|
| Enter Name of tested peripheral here: | | | | | | |
| ON | NORM | OPEN | | | | |
| ON | NORM | CLOSED | | | | |
| ON | REV | OPEN | | | | |
| ON | REV | CLOSED | | | | |
| OFF | NORM | OPEN | | | | |
| OFF | NORM | CLOSED | | | | |
| OFF | REV | OPEN | | | | |
| OFF | REV | CLOSED | | | | |

## 10-7-5 Probe Leakage Current Test

### 10-7-5-1 Definition

This test measures the current that would flow to ground from any of the probes through a patient who is being scanned and becomes grounded by touching some other grounded surface.

### 10-7-5-2 Generic Procedure

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the unit Off and On. For each combination, the probe must be active to find the worst case condition.

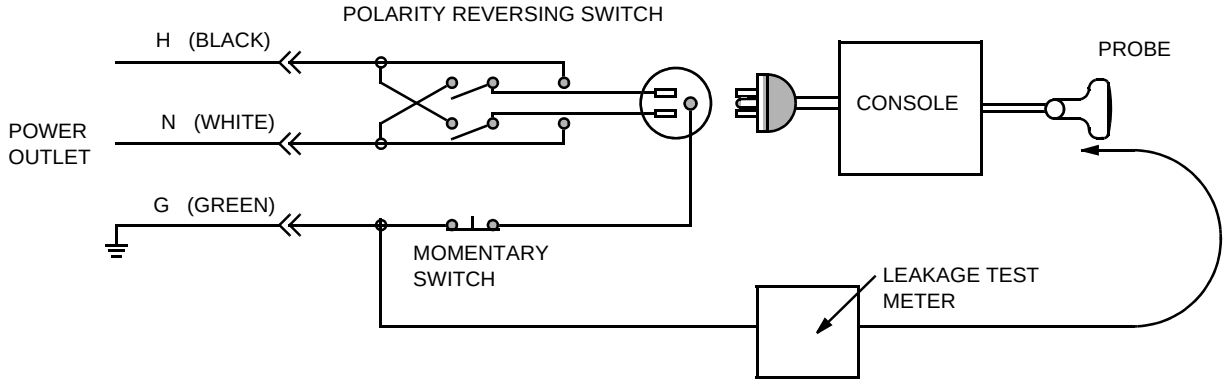



**Figure 10-3 Set Up for Probe Leakage Current**

*NOTE: Each probe will have some amount of leakage current, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement.*

### 10-7-5-3 No Meter Probe Adapter Procedure

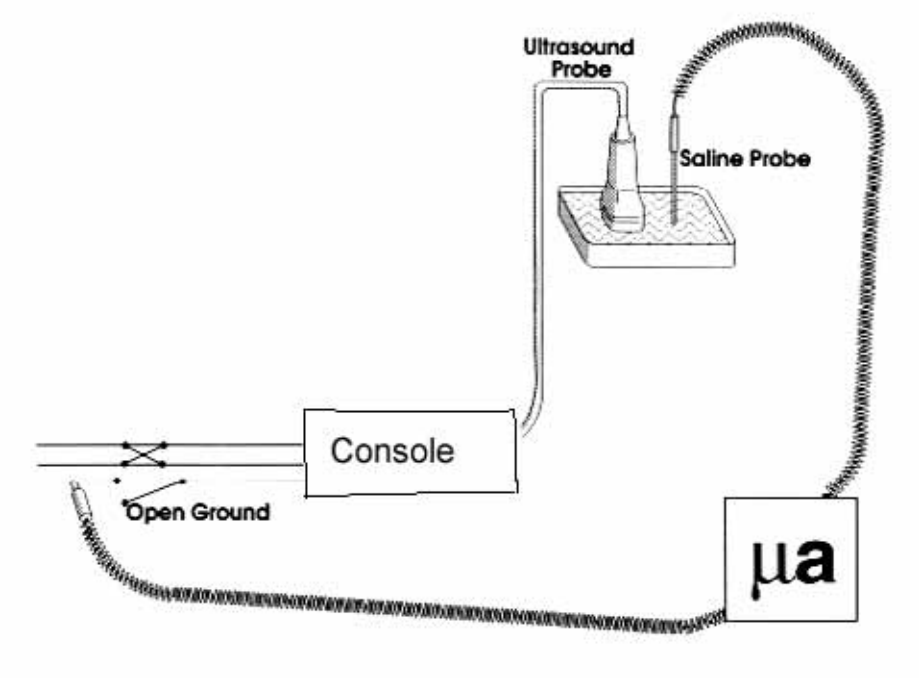



**Figure 10-4 No Meter Probe Adapter Procedure**

Follow these steps to test each transducer for leakage current.

1.) Turn the Vivid™ e unit OFF.
2.) Plug the unit into the test meter, and the meter into the tested AC wall outlet.
3.) Plug the external probe into the meter's “EXTERNAL” connector.
4.) Set the meter's “FUNCTION” switch to EXTERNAL position.
5.) Connect the probe for test with the connector of the console.
6.) Add the saline probe and the imaging area of the probe into the saline bath.
7.) Have unit power ON for the first part; turn it OFF for the second half.
8.) Depress the ISO TEST rocker switch and record the highest current reading.
9.) Follow the test conditions described in Table 10-15 for every transducer.
10.) Keep a record of the results with other hand copies of PM data.

### 10-7-5-4 Data Sheet for Transducer Source Leakage Current

The test passes when all readings measure less than the values shown in Table 10-11. Record all data on the PM Inspection Certificate.

**CAUTION** **Equipment damage possibility. Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged**

**Table 10-15 Typical Data Sheet For Transducer Source Leakage Current**

| Transducer Tested: | | | |
|---|---|---|---|
| **Unit Power** | **Tester Power Polarity Switch** | **Tester GROUND or NUETRAL Switch** | **Measurement** |
| ON | NORM | OPEN | |
| ON | NORM | CLOSED | |
| ON | REV | OPEN | |
| ON | REV | CLOSED | |
| OFF | NORM | OPEN | |
| OFF | NORM | CLOSED | |
| OFF | REV | OPEN | |
| OFF | REV | CLOSED | |

# Section 10-8
# When There's Too Much Leakage Current...

## AC/DC FAILS

Check any broken of the AC/DC adapter and its cable. Replace a new one if any portion defective.

## ENCLOSURE FAILS

Check any broken of the enclosure. Replace any defective part.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

*NOTE: No outlet tester can detect the condition where the white neutral wire and the green grounding wire are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.*

## PROBE FAILS

Change another probe to confirm if the fail is caused by console.

*NOTE: Each probe will have some amount of leakage, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement. The maximum allowable leakage current for body surface contact probe differs from inter-cavity probe. Be sure to enter the correct probe type in the appropriate space on the check list.*

If excessive leakage current is slot dependent, inspect the system connector for bent pins, poor connections, and ground continuity.

If the problem remains with the probe, replace the probe.

## PERIPHERAL FAILS

Inspect wiring for bad crimps, poor connections, or damage.

## STILL FAILS

If all else fails, begin isolation by removing the probes, external peripherals, then the on board ones, one at a time while monitoring the leakage current measurement.

## NEW UNIT

If the leakage current measurement tests fail on a new unit and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.

## ULTRASOUND INSPECTION CERTIFICATE

| Customer Name: | | System ID: | Dispatch Number / Date Performed: | Warranty/Contract/HBS |
|---|---|---|---|---|
| **System Type** | | Model Number: | Serial Number: | Manufacture Date: |
| Probe 1: | Frequency: | Scan Format*: | Model Number: | Serial Number: |
| Probe 2: | Frequency: | Scan Format*: | Model Number: | Serial Number: |
| Probe 3: | Frequency: | Scan Format*: | Model Number: | Serial Number: |
| Probe 4: | Frequency: | Scan Format*: | Model Number: | Serial Number: |
| Probe 5: | Frequency: | Scan Format*: | Model Number: | Serial Number: |

* Scan Format: Phased Array, Linear Array, Curved Array, Mechanical Array or Other

## FUNCTIONAL CHECKS

| Functional Check (if applicable) | OK? or N/A |
|---|---|
| B-Mode Function | |
| Doppler Modes Function | |
| CF-Mode Function | |
| M-Mode Function | |
| Applicable Software Options | |
| Applicable Hardware Options | |
| Control Panel | |
| LCD | |
| Measurement Accuracy | |
| GE Approved Peripherals | |

## PHYSICAL INSPECTION AND CLEANING

| Physical Inspection and Cleaning (if applicable) | Inspect | Clean |
|---|---|---|
| Console | | |
| LCD | | |
| External I/O | | |
| Cables and Connectors | | |
| GE Approved Peripherals (DVD-RW, Printer) | | |
| Labeling (see User Manual for Labeling) | | |
| | | |
| | | |
| | | |
| | | |

## COMMENTS:

_____

_____

_____

_____

## ELECTRICAL SAFETY

| Electrical Test Performed | Max Value Allowed | Value Measured | OK? | Comments |
|---|---|---|---|---|
| **Outlet (correct ground &wiring config.)** | | | | |
| Type BF Applied Part Leakage Current Limits- Probe | | | | |
| enclosure Source Leakage Current - Chassis Leakage Current Limits | | | | |
| Peripheral 1 Leakage Current | | | | |
| Peripheral 2 Leakage Current | | | | |

**PROBES**

| Probe Number (from previous page) | Max Value Allowed | Max Value Measured | OK? | Comments |
|---|---|---|---|---|
| Probe 1: | | | | |
| Probe 2: | | | | |
| Probe 3: | | | | |

Final Check. All system covers are in place. System scans with all probes as expected.

Accepted by: _____

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